Attachment A: MNES Assessment Report

umwelt
Environmental & Social Consultants



WestSide

PL94 COAL SEAM GAS PROJECT

Matters of National Environmental Significance Assessment

FINAL

May 2025

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Matters of National Environmental Significance Assessment

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Westside Corporation Pty Ltd

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Environmental & Social Consultants

This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

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Executive Summary

Westside Corporation Pty Ltd (Westside) are proposing to expand coal seam gas extraction operations in their existing Petroleum Lease (PL) 94 located within the Bowen Basin, known as the PL94 Coal Seam Gas (CSG) Project (the Project). For the purpose of this assessment, PL94 is referred to as the Project Area.

Westside currently operate and maintain 250 CSG wells within the Project Area (referred to as Stage 1). As part of this Project (i.e. Stage 2), Westside are proposing an additional 350 CSG wells to bring the total to 600 within the Project Area. These additional wells are approved under Westside's existing Environmental Authority (EA) issued by the Queensland Government under the *Environmental Protection Act 1994*.

The Project will involve the progressive development, construction, operation and maintenance, decommissioning and rehabilitation of up to 350 CSG wells and associated supporting infrastructure. Existing centralised gas and water processing infrastructure, as well as ancillary infrastructure such as tracks, will be utilised by the Project where available. Based on known Project components and quantities, construction of the Project is estimated to require a disturbance footprint of approximately 500 hectares (ha). The final configuration and location of Project infrastructure components within the Project Area is currently unknown. Potential Project infrastructure locations will be informed by production success, the findings of future resource exploration and the presence of constraints (including but not limited to planning, environmental, cultural heritage, landholder and engineering/constructability).

Using constraints mapping (underpinned by the Matters of National Environmental Significance (MNES) mapping detailed in this report) that is subject to ongoing field verification by suitably qualified ecologists, Westside will implement a site-specific environmental constraints protocol (the Protocol) to guide the siting of Project infrastructure within the Project Area. The Protocol is founded in the hierarchy of mitigation and as such will aim foremost to avoid direct impacts on MNES to the greatest extent possible. Where this is not possible, direct impacts will be strictly limited to maximum disturbance limits. A suite of mitigation and management measures captured in Project management plans will be implemented across the life of the Project to ensure all additional opportunities to minimise or mitigate impacts (including indirect and cumulative) on MNES are taken. As the Project is a brownfield development, many of the relevant environmental management plans and procedures are already developed and in place.

This assessment documents the ecological values within the Project Area including MNES and determines the potential impacts on such values as a result of the Project. The assessment is intended to support the Project's overarching Preliminary Documentation assessment deemed necessary by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) to gain approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), as per the referral decision dated 30 June 2022. Desktop reviews of online datasets, mapping, literature, aerial imagery and LiDAR, and field assessments to characterise and identify ecological values that may be supported in the Project Area have been completed.

Based on species records and the habitat encountered during field surveys and likely to occur within the wider Project Area, a detailed likelihood of occurrence assessment was completed for all species and communities identified in the desktop assessment.

A total of 26 MNES were considered known or potentially occurring including three (3) threatened ecological communities (TECs), three (3) threatened flora species, 12 threatened fauna species and eight (8) migratory species. As migratory species are not a relevant controlling provision for the Project, migratory species were not assessed any further. Potential MNES habitat within the Project Area generally consists of small fragments that are already disturbed and compromised by historical clearing and thinning, exotic weeds and cattle grazing. Although less common, larger and more intact areas of habitat are also present including along the Dawson River and Kianga Creek, as well as in some road reserve sections.

In accordance with *Significant Impact Guidelines 1.1: Matters of National Environmental Significance* (Department of the Environment, 2013b), impact assessments were undertaken for the 18 known or potentially occurring threatened species and communities. Although the Project does not have a defined footprint, a high level of confidence in the nature and extent of direct impacts across the life of the Project and the associated phases is available (see **Section 7.0**). The Project has adopted several strict rules that will inform the planning and siting of Project infrastructure. In addition, all proposed infrastructure locations will be subject to a field scout by a suitably qualified ecologist to ensure a contemporary assessment of MNES presence (a key constraint) is completed immediately prior to impact.

With the implementation of the Protocol (discussed in **Section 8.1**) and several other Project management plans that detail species-specific and general mitigation measures (detailed in **Section 8.2**), it was determined that the Project is unlikely to result in a significant impact on all but two MNES values relevant to Project Area.

Project-related impacts on the ornamental snake (*Denisonia maculata*), which is known to the Project Area, are considered potentially significant primarily based on the magnitude of direct impacts. Although the removal of 16.0 ha of suitable habitat is very minor relative to the extent of habitat that will remain (reduction of available habitat by 0.3%), species-specific guidance outlined the *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (Department of Climate Change, Energy, the Environment and Water, 2024) indicates there is a 'high risk of significant impacts' where 2.0 ha or more of important habitat is lost.

Although the koala (*Phascolarctos cinereus*) is not known to the Project Area, Project-related impacts on the species are also considered potentially significant. Three of the four potential habitat utilisation categories are considered notably more valuable to the species due to the habitat features supported: climate refugia, breeding and foraging and shelter. Dispersal habitat (the fourth category of suitable habitat), predominantly comprises historically cleared exotic pasture and has low ecological value. Given the large extent of historical clearing within the Project Area and local region, it is acknowledged that habitat suitable to fulfil the full suite of life-cycle requirements is likely already very low. As such, the combined direct impacts to breeding and foraging habitat and shelter habitat (a total area of 8.9 ha) may overall reduce the availability of habitat resources important for foraging, predator avoidance and thermoregulation needed to continue to maintain any population present. Although up to 400 ha of dispersal habitat may also be directly impacted via vegetation clearing, this habitat loss is for the most part temporary, as it will essentially be immediately re-instated following construction (dispersal habitat is dominated by modified pasture to support cattle grazing land use). To ensure habitat functionality is maintained, Westside will ensure that no more than 1% of the dispersal habitat limit (i.e. 4 ha) comprises trees (measured by canopy cover). As trees that occur within dispersal habitat may provide predator avoidance opportunities, trees of any species will be considered. Additional mitigation measures are proposed to further avoid or minimise impacts on koala and maintain habitat function.

Due to the predicted significant residual impacts on ornamental snake and koala as a result of the Project, land-based offsets are proposed (see Attachment E of the PD).

A summary of the MNES assessment results, including likelihood of occurrence, impacts and significant impact assessment is presented in **Table ES.1**.

Table ES.1 Summary of Impact Assessment on MNES

MNES	Likelihood of Occurrence	Habitat / Impact			Significant Impact Test Outcome
		Habitat Utilisation Categories	Max Direct Impact (ha)	Max Direct Impact (% of total available)	
Threatened Ecological Communities					
Brigalow TEC	Known	-	0.9	0.09	Unlikely
Coolibah TEC	Known	-	0.0	0.0	Unlikely
Poplar Box TEC	High	-	0.0	0.0	Unlikely
Threatened Flora					
Xerothamnella herbacea	Known	Potential	1.0	0.09	Unlikely
Solanum dissectum	Known	Potential	1.0	0.09	Unlikely
Solanum johnsonianum	Known	Potential	1.0	0.09	Unlikely
Threatened Fauna					
Squatter pigeon (southern) (*Geophaps scripta scripta*)	Moderate	Breeding	1.0	0.06	Unlikely
		Foraging	1.0	2.2	
		Dispersal	40.0	1.3	
Ornamental snake (*Denisonia maculata*)	Known	Suitable habitat	16.0	0.33	**Potential**
Koala (*Phascolarctos cinereus*)	High	Climate refugia	0.0	0.0	**Potential**
		Breeding and foraging	2.0	0.25	
		Shelter	6.9	0.86	
		Dispersal	400.0	2.45	Unlikely
Painted honeyeater (*Grantiella picta*)	Moderate	Foraging and dispersal	6.9	0.27	Unlikely
Australian painted snipe (*Rostratula australis*)	Moderate	Seasonal breeding, foraging and dispersal	6.0	0.44	Unlikely
Greater glider (southern and central) (*Petauroides volans*)	High	Denning	0.0	0.0	Unlikely
		Foraging and dispersal	2.0	-	Unlikely
White-throated snapping turtle (*Elseya albagula*)	High	Breeding, foraging and dispersal	.0	0.0	Unlikely
Fitzroy River turtle (*Rheodytes leukops*)	High	Breeding, foraging and dispersal	0.0	0.0	Unlikely
White-throated needletail (*Hirundapus caudacutus*)	Moderate	Foraging and dispersal	No limit[1]	NA	Unlikely

[1] This species is a non-breeding migrant to Australia and is mostly aerial, foraging on the wing and moving with weather systems. Based on the species ecology, no clearing limit has been applied.

MNES	Likelihood of Occurrence	Habitat / Impact			Significant Impact Test Outcome
		Habitat Utilisation Categories	Max Direct Impact (ha)	Max Direct Impact (% of total available)	
Yellow-bellied glider (south-eastern) (*Petaurus australis australis*)	Moderate	Denning, foraging and dispersal	0.0	0.0	Unlikely
Yakka skink (*Egernia rugosa*)	Moderate	Breeding, foraging and dispersal	0.0	0.0	Unlikely
Boggomoss snail (*Adclarkia dawsonensis*)	Moderate	Breeding, foraging and dispersal	0.0	0.0	Unlikely

Abbreviations

Abbreviation	Description
ALUMC	Australian Land Use and Management Classification
ALA	Atlas of Living Australia
ASL	Above sea level
AU	Assessment Unit
BPA	Biodiversity Planning Assessment
cm	Centimetres
CSG	Coal seam gas
DBH	Diameter at Breast Height
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DESI	Department of Environment, Science and Innovation (QLD)
DoR	Department of Resources (QLD)
EA	Environmental Authority
EMP	Environmental Management Plan
EP Act	*Environmental Protection Act 1994* (QLD)
EP Reg	Environmental Protection Regulation 2019 (QLD)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
ERA	Environmentally Relevant Activity
ESA	Environmentally Sensitive Areas, as defined under Schedule 19 of the EP Reg
GBO	General biosecurity obligation
GDE	Groundwater-dependent ecosystem
GIS	Geographic Information Systems
GPS	Global Positioning System
ha	Hectares
HVR	High-value regrowth
km	Kilometre
km/hr	Kilometres per hour
KoRV	Koala Retrovirus
kV	Kilovolt
L	Litre
LIKT	Locally important koala tree
m	Metre
MNES	Matters of National Environmental Significance
MU	Matter Unit
NC Act	*Nature Conservation Act 1992* (QLD)
NSW	New South Wales
PD	Preliminary Documentation
PL94	Petroleum Lease 94

Abbreviation	Description
PMST	Protected Matters Search Tool
Project Area	The bounds of PL94 which has been subject to ecological assessment
QLD	Queensland
RE	Regional Ecosystem
REDD	Regional Ecosystem Description Database
RFI	Request for Information
RoW	Right of Way
RPZ	Riparian Protection Zone
SCL	Strategic Cropping Land
SMP	Species Management Plan
SPRAT	Species Profile and Threats
SSMP	Significant Species Management Plan
TEC	Threatened Ecological Community
the Project	PL94 Coal Seam Gas Project (EPBC No. 2021/9117)
the Protocol	Westside Environmental Constraints Planning and Field Development Protocol Petroleum Lease 94
Umwelt	Umwelt (Australia) Pty Ltd
VM Act	*Vegetation Management Act 1999* (QLD)
Westside	Westside Corporation Pty Ltd
WONS	Weed of National Significance

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1.0 Introduction

1.1 Background

Westside Corporation Pty Ltd (Westside) are proposing to expand coal seam gas extraction operations in their existing Petroleum Lease (PL) 94 located within the Bowen Basin, known as the PL94 Coal Seam Gas Project (the Project). For the purpose of this assessment, PL94 is referred to as the Project Area.

Westside currently operate and maintain 250 CSG wells within the Project Area (referred to as Stage 1). As part of this Project (i.e. Stage 2), Westside are proposing the approval of an additional 350 CSG wells to bring the total to 600 on PL94 within the Project Area.

The Project involves the progressive development, construction, operation and maintenance, decommissioning and rehabilitation of up to 350 wells and associated supporting infrastructure. Existing centralised gas and water processing infrastructure, as well as ancillary infrastructure such as tracks, will be utilised by the Project where available.

The final configuration and location of Project infrastructure components within the Project Area is currently unknown. Potential infrastructure locations will be informed by production success, the findings of future resource exploration and the presence of constraints (including but not limited to planning, environmental, cultural heritage, landholder and engineering/constructability).

Under State legislation, the Project will proceed under the existing site-specific Environmental Authority (EA) Permit Number EPPG00783713, administered under the Queensland (QLD) *Environmental Protection Act 1994* (EP Act).

The Project is currently in the process of gaining approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) – referral reference 2021/9117. At the time of the EPBC Act referral, no direct impacts on threatened species, migratory species or threatened ecological communities (TEC) habitat were anticipated. In June 2022, a delegate of the Minister for the Environment and Water determined that the Project is a controlled action with a single controlling provision. This is due to the likelihood of a significant impact on the following matters protected under Part 3 of the EPBC Act:

- Listed threatened species and communities (sections 18 & 18A EPBC Act).

Since the referral decision, the Project has evolved and some direct impacts on threatened species and TEC habitat are now considered possible. Umwelt have prepared this Matters of National Environmental Significance Report (MNES) report to support the Preliminary Documentation (PD) assessment and respond to ecology-specific items outlined in the Request for Information (RFI) and subsequent adequacy review prepared by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) and provided to Westside as part of the EPBC Act controlled action assessment process.

This MNES report includes:

- Relevant information contained in the original referral (2021/9117).

- Further information on the impacts of the Project on MNES and the strategies proposed to avoid, mitigate and manage those impacts, provided in the now superseded *Ecology RFI Response Report* (Umwelt), dated November 2023.
- Updated significant impact assessments for all known and potentially occurring MNES values.
- Updates based on the adequacy review comments provided by DCCCEEW relating to Sections 2.0 (Habitat Assessment), 4.0 (Impact Assessment) and 5.0 (Avoidance, Mitigation and Management Measures).
- Any other relevant information on matters protected by the EPBC Act.

1.2 Project Area

The Project Area (i.e. bounds of PL94 tenure with overlapping mining lease areas removed) is located within the Moura Theodore district of the Banana Shire in QLD and covers a total area of approximately 21,002 hectares (ha). The township of Moura occurs in the northern extent of Project Area and supports the operational base of the Project.

The Project Area comprises a total of 1,226 individual lot and plans and is largely dominated by private agricultural properties including cattle grazing and some cropping. The Dawson Mine operated by Anglo American Australia occurs immediately east of the Project Area and is a visible landmark throughout much of the eastern PL areas.

The Project Area is depicted on **Figure 1.1**.

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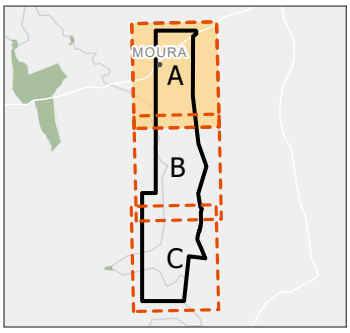
FIGURE 1.1

Project Area

Legend

- Major Watercourse
- Roads
- Railway
- Project Area (Petroleum Lease 94)
- Cadastre





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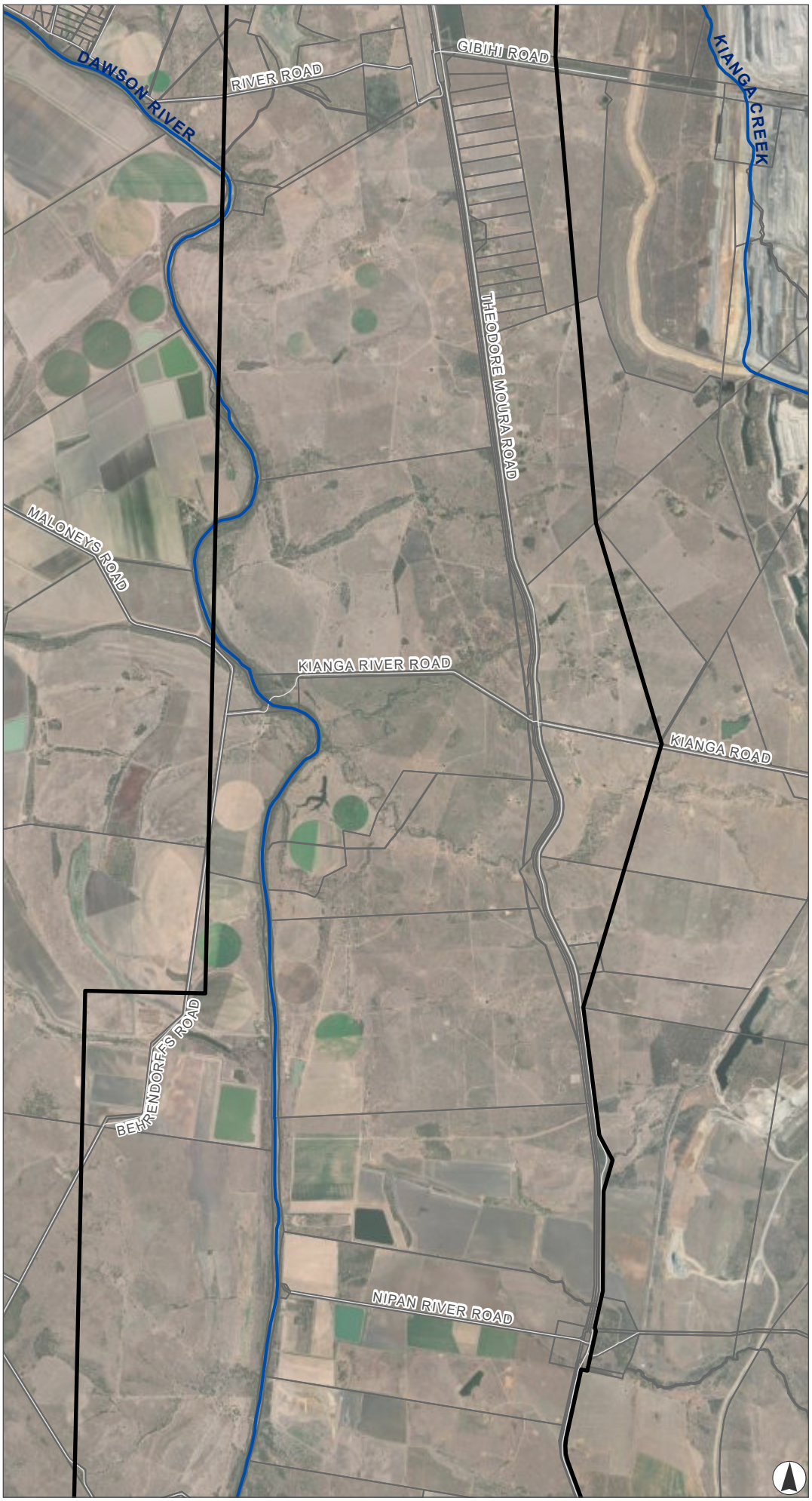

FIGURE 1.1

Project Area

Legend

- Major Watercourse
- Roads
- Project Area (Petroleum Lease 94)
- Cadastre

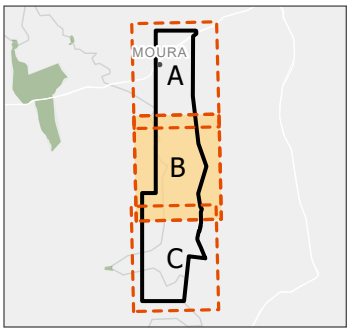



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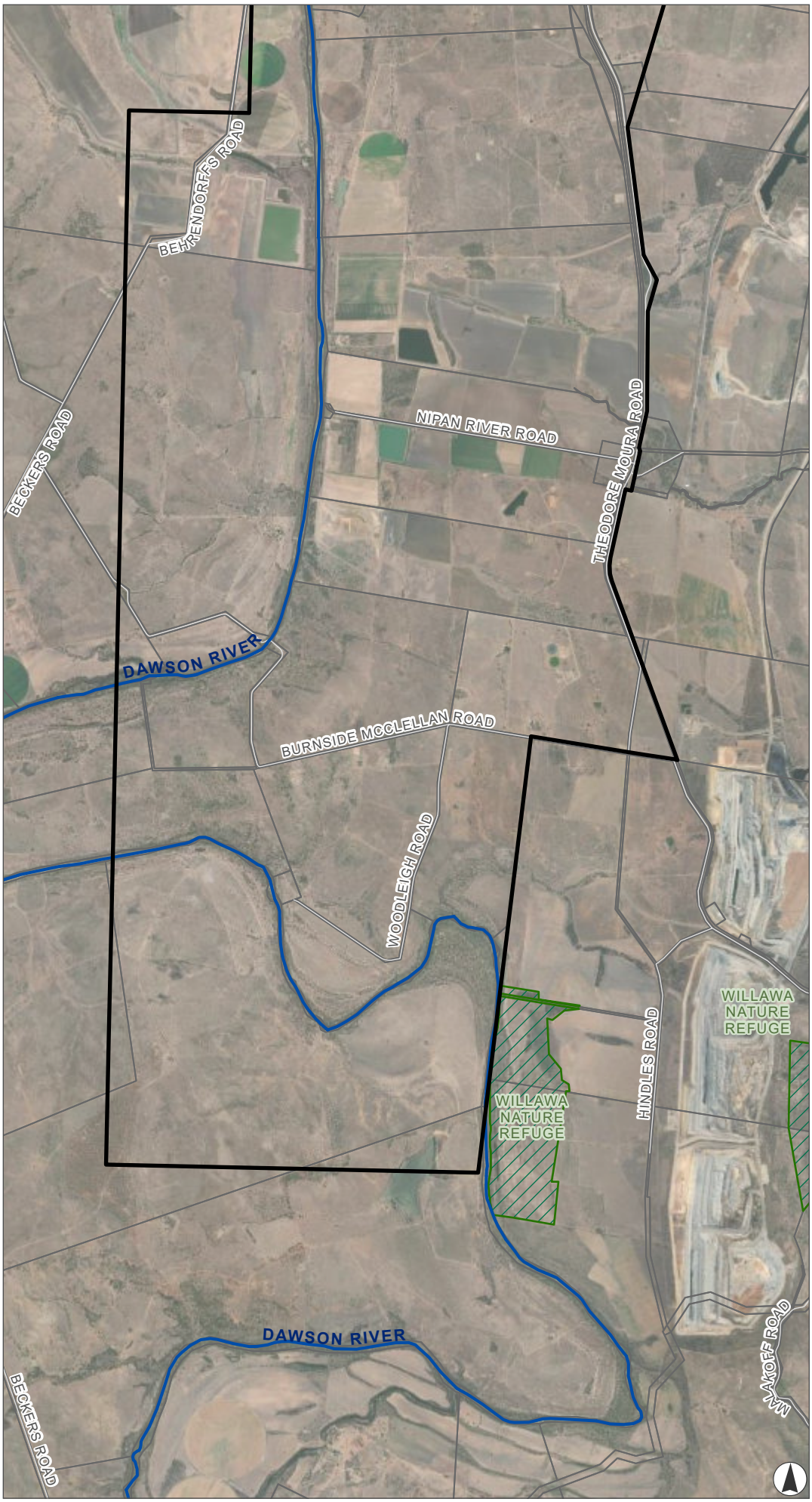
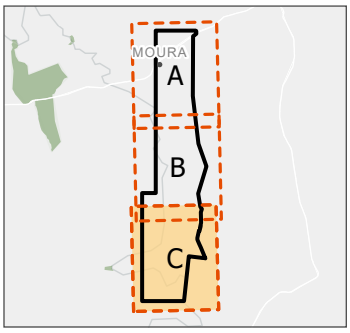
FIGURE 1.1

Project Area



Legend

- Major Watercourse
- Roads
- Project Area (Petroleum Lease 94)
- Cadastre
- Nature Refuge





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2.0 Project Description

The Project Area is a brownfield site which currently contains:

- 250 gas production wellheads, constructed from 1996 as part of Stage 1 works and continuing to be implemented.
- Ancillary linear infrastructure including gas and water pipelines, access tracks, power lines, and communication lines necessary for the 250 gas production wells.
- Gas compression facilities.
- Water management infrastructure including purpose built above ground tanks with double liners.
- Other ancillary activities and facilities to support construction and operations.

The Project comprises the second stage of development of natural gas production within the Project Area and includes the construction, operation, and rehabilitation of the following:

- 350 gas production wellheads: both single and multi-well pads with a preference for multi-well pads where feasible.
- Ancillary linear infrastructure including gas and water pipelines, access tracks, power lines, and communication lines.
- Gas compression facilities upgrades as required.
- Water management infrastructure.
- Other ancillary activities and facilities to support construction and operations.

The Project does not have a firm footprint or layout. The final number, well type, and location of these activities will be determined progressively over the life of the Project development. As understanding of the gas resource increases, investment decisions will be made about the location, scale and timing of the field development. Development timing will also be determined by the proximity to, and synergies with, existing and planned facilities that have been previously approved. However, based on known Project components and quantities, construction of the Project is estimated to require a disturbance footprint of approximately 500 ha.

The *Westside Environmental Constraints Planning and Field Development Protocol Petroleum Lease 94* (the Protocol) (Attachment C of the PD) will be implemented to select and finalise infrastructure locations. The Protocol documents the process for validating the presence and extent of MNES and implementing the hierarchy of management principles. The Protocol will also be the primary mechanism to ensure compliance with State and Commonwealth approval conditions.

Westside is anticipating that the Project will commence once approvals are obtained and will be undertaken over a period of 50 years as per the below timing:

- Construction – the construction of 350 wells will be developed progressively over a period of 30 years.
- Operation – the life expectancy of a well is expected to be approximately 20 years.
- Decommissioning – the decommissioning of a well is not expected to occur until the well has been producing for at least 20 years.

All rehabilitation will be carried out in accordance with State regulations and conditions of the EA issued under the EP Act. These conditions are expected to be consistent with the Project's Rehabilitation Plan.

2.1 Wells

Production wells to be installed as part of the Project may be single or multi-well pads. The preference will be to install multi-well pads where this is feasible.

Single well pads will result in a maximum 1.0 ha disturbance during construction and a 0.6 ha disturbance area post construction in accordance with the current Queensland governmental standards. Multi-well pads (i.e. the preferred well option) will result in a maximum disturbance of 2.0 ha during construction and less than 1.0 ha disturbance during operation. Whilst multi-wells do create a larger disturbance area, overall, they result in a net reduction of land disturbance as a reduced number of single well pads are required. Multi-well pads can host up to five well heads.

Building on more than 25 years' experience of production within the Project Area, the preferred style of development wells are double-lateral wells (DLWs). Westside have successfully constructed and operated DLWs since 2011, and have demonstrated that production performance is better, interventions reduced, and uptime improved with DLWs.

2.1.1 Standard Drilling Methodology

Before the drill rig is mobilised to site, the drill site and access tracks are prepared. This includes clearing vegetation within proposed infrastructure location and removing topsoil using earthmoving equipment. Topsoil is stockpiled and stored appropriately for later rehabilitation use. Finally, earthmoving equipment is used to prep the site for construction.

A small drill rig arrives to install a large diameter conductor pipe. The main drill rig sets up over the conductor pipe. The drill rig first drills the surface section of the hole and surface casing is then cemented in place by pumping cement into the casing and circulating back through the surface wellbore. This cement isolates any shallow surface aquifers from the hydrocarbon bearing formation and prevents cross contamination.

The second stage is to drill the production section of the hole, which is cased and cemented inside the surface casing in the same manner. Above the target formations the casing is cemented back to surface, which isolates the formation. The lateral section of the well is then drilled "horizontally" following the coal seam, with a perforated fibreglass liner installed between the production casing and the well's total depth.

A completion rig installs the downhole completion. During the life of a well, a similar rig may need to be mobilised to the well lease to work-over the well to replace the down-hole pump or remediate a down-hole problem.

2.1.2 Directional Drilling Methodology

Horizontal Directional Drilling (HDD) is a trenchless construction method that may be utilised for the installation of pipelines and cables within the Project Area. This method is widely used by several industries including CSG and civil utilities including electrical, water, telecommunications and sewerage. For Westside operations, this drilling method is only considered when standard drilling methods are not feasible, noting it requires specialist equipment and is highly dependent on the nature of the subsurface soil and bedrock materials within the proposed infrastructure location. However, the use of directional drilling (often referred to as trenchless drilling) does have environmental benefits as it:

- Avoids direct disturbance to the pipeline location other than at the drilling launch and receipt points.
    - Allows for the installation of pipelines and cables beneath watercourses without disturbing the riparian vegetation or water body itself. This helps to preserve ecosystem composition, function and quality as well as waterbody characteristics including water quality and flows.
    - The drilling launch and receipt points can be positioned outside sensitive areas (e.g. MNES habitat)
- Reduces sediment release.
    - Traditional open-cut methods can stir up sediments, which can harm aquatic life and degrade water quality. HDD can minimise this risk by drilling beneath the watercourse, reducing sediment release.
- Drilling fluids are contained.
    - HDD uses drilling fluids to lubricate the drill bit and remove cuttings. These fluids are contained within the borehole, reducing potential exposure to the surface environment and the risk of chemical spills and contamination.
- Inadvertent Returns Management.
    - HDD includes measures to manage inadvertent returns (unintended release of drilling fluids to the surface). This helps prevent the spread of chemicals into unintended areas.

If deemed critical for the development of the Project, Westside may employ directional drilling methods to construct underneath areas of MNES constraint including, but not limited to, watercourses such as the Dawson River and associated riparian vegetation. Any directional drilling works will be subject to detailed planning and review on a site-by-site basis to ensure environmental values (including MNES habitat, groundwater and surface water) are not compromised in any way.

2.2 Gathering Lines and Gas Compression Facilities

To transport the produced gas and associated water from the production wells to the gas and water facilities, Westside will utilise new and existing gathering infrastructure. Construction of new gathering lines will be undertaken using a combination of conventional earthmoving equipment and specialist pipeline trenching equipment. Gathering lines will be High Density Polyethylene (HDPE) pipe and will be designed and constructed to comply with:

- Australian Standard AS2885 – Pipelines Gas and Liquid Petroleum.
- Code of Practice: For the construction and abandonment of coal seam gas and petroleum wells, and associated bores in Queensland (DNRME, 2018).
- Australian Pipelines and Gas Association Ltd (APGA) Code of Environmental Practice (2017).

Existing gas compression facilities will be utilised for export to domestic and/or international markets. Sales gas from the compression facility would be transported through existing gas pipelines in the area. If necessary, additional gas compression facilities would be constructed.

2.3 Ancillary Facilities

It is expected that existing Stage 1 laydown areas, offices and workshops and accommodation will continue to support the Project. Waste will continue to be managed in accordance with the Project's EA and waste management requirements of the QLD *Waste Reduction and Recycling Act 2011*.

3.0 Legislative Context

3.1 Commonwealth Legislation

3.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is administered by DCCEEW. Under the EPBC Act, if the Minister for the Environment and Water determines that an action is a 'controlled action' which would have or is likely to have a significant impact on MNES or Commonwealth land, then the action may not be undertaken without prior approval from the Minster. The EPBC Act identifies nine MNES:

- World Heritage properties
- National Heritage places
- Ramsar Wetlands of International Significance
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- Water resources (in relation to coal seam gas development and large coal mining development).

Under the EPBC Act, any action that is likely to have a significant impact on these matters may be deemed a controlled action.

3.2 Relevant QLD Legislation

Species and communities listed under the EPBC Act, and the vegetation and habitat associated with those values, may also be protected under QLD legislation as described below.

3.2.1 Environmental Protection Act 1994

The EP Act and the Environmental Protection Regulation 2019 (EP Reg) regulates environmental harm caused by Environmentally Relevant Activities (ERAs), which include resource activities. An EA is required to carry out petroleum or mining activities and generally includes a suite of environmental conditions relating to the protection of environmental values including biodiversity.

The Project includes ERAs and as such requires approval under the EP Act. The Project has current approval under the EP Act dated 20 December 2022 pursuant to EA number EPPG00783713.

3.2.2 Nature Conservation Act 1992

The purpose of the *Nature Conservation Act 1992* (NC Act) is to conserve biodiversity by creating and managing protected areas, managing and protecting native wildlife, and managing the spread of non-native wildlife.

The Nature Conservation (Plants) Regulation 2020 and Nature Conservation (Animals) Regulation 2020 lists species that are classed as threatened in QLD. The following threatened species conservation classes are defined in the NC Act: Extinct; Extinct in the Wild; Critically Endangered; Endangered; and Vulnerable. Species can also be classed as Near Threatened if they are at risk of becoming threatened in the near future.

3.2.3 Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VM Act) establishes the vegetation management framework for QLD which applies to all vegetation and regulates the clearing of native vegetation in QLD, with the exception of state forests, national parks, forest reserves and certain other tenures defined under the NC Act and *Forestry Act 1959*.

A primary purpose of the VM Act is to regulate the clearing of vegetation in a way that conserves remnant vegetation identified as a Regional Ecosystem (RE). REs are vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil (Sattler and Williams, 1999). The Biodiversity Status of a RE is used in the designation of Environmentally Sensitive Areas (ESAs) and used for regulation of the petroleum industry through provisions in the EP Act. In QLD, TECs can be broadly defined based on the RE framework (in conjunction with other diagnostic and conditional criteria), with TECs often corresponding to one or many REs.

3.2.4 Biosecurity Act 2014

The *Biosecurity Act 2014* imposes a 'general biosecurity obligation' (GBO), which imparts a responsibility on all individuals or organisations to manage biosecurity risks that are under their control and that they know about, or should reasonably be expected to know about. Under the GBO, individuals and organisations whose activities present a biosecurity risk must take all reasonable and practical steps to prevent or minimise their activities from causing a biosecurity event.

The Act lists fauna and flora pest species as either a prohibited or restricted biosecurity matter.
A prohibited matter is any species which has not yet become established in QLD and would have significant adverse impacts on human health, social amenity, the economy or the environment if it entered the state.
A restricted matter is any species that is already established within QLD and has significant adverse impacts on human health, social amenity, the economy or the environment. Restricted matters are required to be managed by landholders or land managers so that they do not spread further. The Act defines specific requirements for notification and management actions for all listed biosecurity matters, including specific requirements for the disposal of restricted matters.

4.0 Methodology

4.1 Desktop Assessment

A comprehensive desktop assessment was undertaken to compile all existing information on ecological values and associated MNES that may be supported in the Project Area and areas adjacent. The desktop assessment included a review of scientific literature relating to MNES, review of the methods and results of existing ecological surveys conducted in the Project Area, and searches of publicly available datasets and online mapping. The results were used to compile preliminary likelihood assessments, which identified the target threatened species and communities and any potential habitat areas within the Project Area. Survey methods were based on this information and were prepared in accordance with the appropriate Commonwealth and State guidelines.

4.1.1 Database Searches

As part of this assessment, the following information database sources were reviewed, with the Protected Matters Search Tool (PMST) re-run in 2024 and early 2025 to ensure a contemporary assessment of MNES:

- EPBC Act Protected Matters Search Tool for MNES (Department of Climate Change, Energy, the Environment and Water, 2025a) (10 kilometre (km) buffer applied to the Project Area) (**Appendix A**).
- Department of Environment, Science and Innovation (DESI) (2024) WildNet record database for species records (20 km buffer applied to the Project Area).
- Atlas of Living Australia (ALA) (2024) spatial portal for publicly available species records.
- Department of Environment and Science (DES) (2023) Flora Survey Trigger Map for Clearing Protected Plants in Queensland – Version 10.0, to identify the locations of previously recorded threatened flora species.
- DES (2020) Biodiversity Planning Assessment (BPA) – Brigalow Belt mapping to identify significant wildlife corridors of State, Regional and Local biodiversity significance.
- DES (2018) Groundwater dependent ecosystems and potential aquifer mapping – QLD.
- DES (2023b) Land use mapping – 2021- Great Barrier Reef NRM regions.
- Department of Resources (DoR) (2024) Vegetation Management Supporting Report, including Essential Habitat mapping.
- DoR (2023a) Vegetation Management Pre-clear Regional Ecosystem map (Version 3).
- DoR (2023b) Vegetation Management Regional Ecosystem map (Version 13).
- DoR (2019) Contours – 1 m and 10 m interval map.
- DoR (2007) Soil and land use mapping for the Dawson Valley.
- The Cornell Lab of Ornithology eBird webpage (eBird Australia, 2025).

- The DCCEEW (2023) Interactive National Flying-fox monitoring viewer.
- The Australasian Bat Society BATMAP (Australasian Bat Society Inc, 2025).
- QLD Herbarium (2023).Regional Ecosystem Description Database (REDD) (Version 13).
- DES (2023) Potential habitat models – 2022- Habitat Suitability Models QLD.
- Department of Climate Change Energy the Environment and Water (2024) Species of National Environmental Significance distribution mapping.
- Historical aerial imagery (Q Imagery, 2024).

4.1.2 Literature Review

The literature review was two-fold and incorporated both reviewing of scientific literature relating to MNES, and a review of the methods and results of previous ecological studies undertaken within the Project Area and wider region to broaden the understanding of potentially occurring MNES.

4.1.2.1 Scientific Literature

The following relevant scientific literature was reviewed in relation to potentially occurring MNES to increase understanding of values and required survey methods:

- Species Profile and Threats (SPRAT) database for detailed MNES information (Department of Climate Change, Energy, the Environment and Water, 2025b).
- Potential habitat models thresholded – fauna 2022 – Queensland (Department of Environment, Science and Innovation, 2022).
- *Survey Guidelines for Australia's Threatened Mammals* (Department of Sustainability, Environment, Water, Population and Communities, 2011).
- *Survey Guidelines for Australia's Threatened Birds* (Department of Environment, Water, Heritage and the Arts, 2010).
- *Survey Guidelines for Australia's Threatened Reptiles* (Department of Sustainability, Environment, Water, 2011).
- *Draft Referral Guidelines for nationally listed Brigalow Belt reptiles* (Department of Climate Change, Energy, the Environment and Water, 2023a).
- *Draft referral guideline for the 14 birds listed migratory under the EPBC Act* (Department of the Environment, 2015).
- *Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (Department of the Environment and Energy, 2017).
- *Terrestrial Vertebrate Fauna Survey Guidelines for QLD Version 4* (Eyre, Ferguson, *et al.*, 2022).
- *A review of koala habitat assessment criteria and methods* (Youngentob, Marsh and Skewes, 2021).

- *Assessment of Seasonal Habitat Characteristics as Predictors of Habitat Suitability for the Threatened Ornamental Snake (Denisonia maculata)* (Veary, 2011).
- *Guide to greater glider habitat in Queensland* (Eyre, Smith, *et al.*, 2022).
- Available conservation advice, commonwealth listing advice and recovery plans for all species identified during the desktop assessment.

4.1.2.2 Previous Ecological Studies – Project Area

Several ecological assessments have been conducted within the Project Area, or adjacent, since 2013. The methodology and results in these reports were reviewed to determine previously identified MNES and associated survey effort, where applicable. The results of the older studies were reviewed in the context of updated threatened species and community listings (including habitat definitions) under the EPBC Act as required.

Ecological assessments which have been reviewed and considered as part of this MNES assessment are summarised below in **Table 4.1**.

Table 4.1 Summary of Previous Ecological Studies

Survey Timing	Surveyor	Summary	Survey Effort
August 2013	Niche Environment and Heritage	Undertook an ecological assessment of four proposed exploration drill sites within the nearby Belvedere Coal Project lease area, situated approximately 10 km north of the Dawson Highway midway between Moura and Banana, between Kianga and Banana Creeks.	Two days
June 2016	Arris Pty Ltd	Undertook an ecological site assessment for Moura Central "De-Bottlenecking" Pipeline project situated near the Project Area. A field survey was undertaken along the proposed pipeline route, 10 km south of Moura on Theodore Baralaba Road.	One day
January 2017	Arris Pty Ltd	Undertook a desktop ecology assessment of the planned 2017 Development Sites within the Project Area. The assessments focused on groups of wells in the Hillview/Pretty Plains Gas Fields, Moura Central Gas Fields and Dawson River Gas Fields.	-
July 2017	Arris Pty Ltd	Undertook an ecological field survey as part of the 2017 2D Seismic Campaign within the Project Area. The field survey was conducted within the Hills/Lang Gas Fields, Dawson River Gas Fields, and the southern portion of the Moura Central Gas Field.	Four days
November 2017	Arris Pty Ltd	Undertook an ecological field survey of the 2018 Wells Program Area within the Project Area. The survey was undertaken across four sections: the Hillview/Pretty Plains Gas Fields, Moura Central Gas Fields, Nipan Gas Fields and the Dawson River Gas Fields.	Two days
August 2018	Arris Pty Ltd	Undertook a ecological field survey to assess vegetation and fauna as part of the 2018 Seismic Campaign, which proposed seismic activities within the northern section of the Project Area (Hillview, Pretty Plains, Moura Central and Nipan Gas Fields), some areas within the proposed Mungi North and Mungi West petroleum lease applications and mining lease co-development.	Three days

Survey Timing	Surveyor	Summary	Survey Effort
February 2019	Arris Pty Ltd	Undertook a desktop ecology assessment of the Project Area as part of the Westside 2019 Program. The area assessed extends from 4.5 km north of Moura to 25 km South of Moura on the Theodore Baralaba Road.	-
October 2019	Umwelt	Undertook an ecology assessment as part of an EA amendment application for the Project Area. The survey effort focused on properties that supported representative habitat of the broader petroleum lease, with properties identified as being a potential location for petroleum activities being preferentially targeted.	Four days
November 2019	Otto Agribusiness	Undertook a flora survey targeting threatened flora within Lot 3 SP122581.	Three days
November 2019	Umwelt	Undertook an ecology assessment of the proposed Meridian Trunk Line Phase 2. The survey followed the proposed alignment with a 25 m buffer either side.	Two days
November 2019	Umwelt	Undertook an ecology assessment of the proposed Moura Central Processing Plant to Hillview Processing Plant pipeline. The survey followed the proposed pipeline with a 25 m buffer either side.	Three days
December 2019	Eco Logical Australia	Undertook an ecological assessment at locations of proposed coal seam gas (CSG) infrastructure within the Project Area. The survey effort focused on properties to be significantly disturbed by the proposed infrastructure with a 25 m buffer either side.	Five days
December 2019	Otto Agribusiness	Undertook a flora survey targeting threatened flora within Lot 2 SP122581.	Three days
February 2020	Otto Agribusiness	Undertook a flora survey targeting threatened flora within Lot 47 DW143.	Six days
March 2020	Eco Logical Australia	Undertook an ecological assessment at locations of proposed CSG infrastructure within the Project Area. The assessment focused on proposed infrastructure items MN74, MTLPH_3 and PP16. A 25 m buffer was applied to MTLPH_3 and PP16, with a wider survey area applied to MN74 as provided by Westside.	Three days
March 2020	Umwelt	Undertook an ecological assessment for the Project targeting nocturnal fauna including, but not limited to, ornamental snake, koala and greater glider (southern and central). Survey effort comprised both day and night work and occurred across several properties within the Project Area.	Five days
March 2021	Umwelt	Undertook an ecological assessment of a Permit to Disturb area associated with the Project Area. The survey followed the proposed PTD area with a 25 m buffer either side.	Two days
July 2022	Eco Logical Australia	Undertook an ecological assessment at locations of proposed CSG infrastructure on two properties within the Project Area.	Three days
August 2022	Eco Logical Australia	Undertook an ecological assessment at locations of proposed CSG infrastructure on two properties within the Project Area.	Four days
March 2023	Greentape Solutions	Undertook an ecological assessment at locations of proposed CSG infrastructure on one private property within the Project Area.	Two days

Survey Timing	Surveyor	Summary	Survey Effort
June 2023	Umwelt	Undertook a targeted ornamental snake habitat survey, focusing on properties that supported representative habitat of the broader area in line with the previous targeted survey. Also completed during this survey was an assessment of two proposed CSG infrastructure locations within the Project Area (one road reserve, one within a private property).	Five days
April 2024	28 South	Undertook an ecological assessment at locations of proposed CSG infrastructure on several properties within the Project Area.	Nine days
	Umwelt	Surveyed habitat quality at representative locations within the Project Area to inform the Project's offset area management plan.	Five days

The methods used by Umwelt in assessments undertaken for the Project (2019 to 2024) are summarised in **Section 4.3**.

4.1.2.3 Previous Ecological Studies – Wider Region

Using the interactive PMST portal, projects that have been referred for assessment under the EPBC Act that occur within 50 km of the Project Area were also reviewed, specifically to understand recorded occurrences of MNES. Only projects that were contextually relevant (i.e. excludes Project's with overly large or linear action areas) and supported by ecological studies were considered. Key projects reviewed include the following:

- Moura Solar Fam (Referral Number 2021/8973), located to the northeast of the Project Area.
- Theodore Wind Farm (Referral Number 2024/09842), located to the southeast of the Project Area.
- Banana Range Wind Farm (Referral Number 2019/8503), located to the northeast of the Project Area.
- Dawson West Mining Project (Referral Number 2018/8269), located to the southwest of the Project Area.

4.2 Likelihood of Occurrence

A likelihood of occurrence assessment was completed for MNES communities and species identified in the desktop assessment. Each MNES value was assessed against the categories outlined below in **Table 4.2**.

Likelihood assessments were made prior to undertaking field surveys based on State vegetation mapping, aerial interpretation, database records obtained during the desktop assessment and the results of previous ecological assessments, mapped species / community distribution and ecological requirements / habitat preferences of MNES. The likelihood assessment for each threatened species and ecological community was reviewed and updated at the conclusion of each field survey to reflect the survey results.

These updates were associated with:

- changing the assessment of likelihood to 'known' if a species was found to be present during the field surveys, or
- reducing the likelihood of occurrence, based on an absence of habitat within the Project Area.

The likelihood score was not downgraded in response to a failure to detect a species during field surveys when habitat suitable for the species was identified within the Project Area. This approach accommodates natural changes in the distribution and abundance of species over time and was applied in acknowledgement of the limitations of field sampling methods and survey conditions, which may not capture all target species present at the time of sampling.

This approach is an application of the precautionary principle that underpins ecological assessment, which errs on the side of conservative assumptions regarding species range and habitat. Whilst the survey effort undertaken is appropriate for the baseline assessment presented at this time, it is possible that as more comprehensive data is collected during subsequent field scouts, this data will be used to refine the assessments and may lead to less conservative conclusions.

The likelihood of occurrence outcomes were reassessed again in April and October 2024 to consider updates to species distributions and publicly available records. The completed likelihood of occurrence assessment is provided in **Appendix B**.

Table 4.2 Likelihood of Occurrence Definitions

Category	Description
Known	The listed species or TEC has been recorded in the Project Area during the past decade (or during the Project-specific survey period). Record is considered valid and associated with a high spatial confidence.
High	Given the extent, quality and suitability of habitat in the Project Area, the location of the Project Area relative to existing contemporary records (past 20 yrs [2]) of the species (with consideration of sampling effort in the region and the species' detectability) it is highly likely that the species occurs in the Project Area. Also includes species likely to regularly occur in the Project Area during migratory, short-distance seasonal or nomadic movements (including cases for which likelihood of occurrence is high regardless of the nature of habitat present in the Project Area). The TEC has one or more corresponding RE mapped within the Project Area, and key species have been recorded from the broader area (desktop search extent).
Moderate	Potential [3] or suitable habitat is present in the Project Area though given the distribution of records in the surrounding region and/or the species' detectability a moderate rating for likelihood of occurrence is deemed more appropriate than a low or high rating. Includes species that may be present or may occasionally utilise the Project Area but for which there may be little information or those that are either cryptic or occur at low densities. Also includes species that may occasionally occur in the Project Area during migratory, short-distance seasonal or nomadic movements. The TEC has one or more corresponding RE mapped within the Project Area; however, key species have not been recorded from the broader area (desktop search extent).
Low	The Project Area either contains limited suitable habitat or only potential/marginal habitat. The species is either very scarce or absent in the surrounding region. The species is deemed unlikely to occur in the Project Area based on the aforementioned factors. The species may disperse through or near the Project Area infrequently. The TEC has no corresponding REs mapped within the Project Area.
Unlikely	The Project Area is fundamentally unsuitable for the species or TEC. For example, this is usually applied to marine species or seabirds for terrestrial sites.

[2] In consideration of any potential land use changes during this period.
[3] As defined in the likelihood of occurrence assessment justification column.

4.3 Field Surveys

Methods outlined below are specific to surveys completed within the Project Area since 2019, including the following completed by Umwelt:

- October 2019 ecology survey to support an EA amendment.
- November 2019 and March 2021– three field scout surveys to assess proposed infrastructure locations.
- March 2020 targeted nocturnal fauna survey.
- June 2023 targeted ornamental snake (*Denisonia maculata*) habitat survey.
- April 2024 habitat quality assessment survey.

4.3.1 Vegetation Communities

Vegetation has been classified and mapped across the Project Area from 2019 to 2024, in accordance with the QLD Herbarium guidelines *Methodology for surveying and mapping regional ecosystems and vegetation communities in QLD*. Assessments were completed in accordance with the document version available at the time including Version 5.0 (Neldner *et al.*, 2019), Version 6.0 (Neldner *et al.*, 2022) and the current Version 7.0 (Neldner *et al.*, 2023).

In line with this method, different survey site types are recognised which differ primarily by the level of detail in the data collected. A total of 23 secondary, 32 tertiary and 334 quaternary sites have been completed for the Project, described further below. Incidental flora species observed during the survey were also recorded including exotic species. To support data collected via secondary, tertiary and quaternary sites, rapid vegetation observations were also recorded. Rapid vegetation observations largely captured high-level vegetation community characteristics, including dominant and notable species.

These sites were recorded primarily in locations where time or access limited the surveyor's ability to complete a more detailed assessment. Locations of vegetation survey sites completed by Umwelt across 2019 to 2024 are depicted in **Figure 4.1**.

Using land zone information and dominant species data, each vegetation community was classified to a specific RE in accordance with the REDD) (QLD Herbarium, 2023). The spatial extent of vegetation was identified in the field via satellite imagery to confirm vegetation boundaries for larger polygons.

Nomenclature used in this report follows that of Brown & Bostock (2021). Introduced species are denoted by an asterisk in the text (*). For consistency, this has been applied to both flora and fauna.

4.3.1.1 Secondary and Tertiary

Secondary sites are used for classification and detailed descriptions of REs and vegetation communities. Using this method, vegetation data is collected along a 10 x 50 m plot, however modified plots may be used where narrow fringing-communities exist i.e. 5 x 100 m plot.

Data collected during a secondary flora site includes:

- all location, environmental and overall structural information (heights and cover of each layer)
- a list of all species present, including the ground layer
- basal area of woody stems (using the Bitterlich stick method)
- percentage cover and stem density measures of abundance
- presence of disturbances (erosion, weeds etc).

Tertiary sites are less detailed than secondary sites but can still be used to classify and produce detailed vegetation community descriptions. Tertiary sites are often collected instead of secondary sites where seasonal conditions such as drought make a full assessment of species impractical. Data collected during a tertiary site is the same as a secondary, with the exception of the species recorded in the ground layer (in this instance only the dominant or conspicuous).

4.3.1.2 Quaternary

Quaternary site data are used primarily as a record of field traverses and to verify regional ecosystem/vegetation mapping. Quaternary sites were collected at regular intervals along a traverse, and/or made where REs/vegetation communities were observed to have changed. The minimum data captured at each quaternary location included:

- date, collector and location
- unique site identifier
- dominant flora species present
- additional data such as remnant vegetation cover, RE mapping unit and structural heights.

4.3.2 Threatened Ecological Communities

EPBC Act listed TECs were validated in the field where analogous REs were identified. Vegetation was evaluated against applicable TEC diagnostic characteristics and condition thresholds as per the approved Conservation Advice or Listing Advice relevant for each TEC.

The field validation of TECs identified as potentially occurring in the desktop assessment was undertaken via a two-step process. The first step involved the identification of analogous REs in the desktop vegetation mapping. These locations were targeted for field surveys. Where an analogous RE was confirmed on the ground, the vegetation composition and structure were evaluated against TEC condition thresholds and key diagnostic characteristics to determine if the community meets the requirements of the TEC. Condition thresholds and key diagnostic criteria used in the assessment reflect those detailed in the TEC's respective Conservation or Listing Advice.

Across the field survey program, a total of 59 TEC assessments were completed targeting:

- Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC (Brigalow TEC).
- Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions TEC (Coolibah TEC).
- Poplar Box Grassy Woodland on Alluvial Plains TEC (Poplar Box TEC).

Brigalow TEC

Brigalow TEC assessments were undertaken to identify vegetation communities meeting the key diagnostic and condition threshold criteria as described in the *Commonwealth Approved Conservation Advice* (Department of the Environment, 2013a). The assessment consisted of collecting the following data at various sites within Brigalow vegetation:

- dominance or co-dominance of brigalow
- constituent brigalow regional ecosystem
- exotic perennial cover (%):
    - condition threshold is exotic perennial plants comprise less than 50% of the total vegetation cover of the patch, as assessed over a minimum sample area of 0.5 ha (100 m by 50 m), that is representative of the patch.
- age of community
- patch size:
    - condition threshold is the patch size is 0.5 ha or more in size.

A total of 51 Brigalow TEC assessments have been undertaken during surveys across the Project Area.

Coolabah TEC

The presence of Coolibah TEC was determined using the criteria outlined in the *Commonwealth Conservation Advice* (Department of Sustainability Environment Water Populations and Communities, 2011). The listed ecological community is limited to patches that meet all the following key diagnostic characteristics and condition thresholds:

- Patch size: the minimum patch size is 5 ha.
- Tree canopy layer: crown cover in the patch must be ≥8%.
- Coolibah and/or Black Box in the tree canopy must be present in the patch that are either:
    - mature trees with a main stem that has a Diameter at Breast Height (DBH) of ≥30 cm; or
    - hollow-bearing trees (live or dead) or of ≥30 cm; or
    - coppiced trees with a main stem that has a DBH of ≥20 cm.

- Ground layer: 10% or more of the ground cover comprises native graminoids, other herbs, chenopods and/or native low shrubs (i.e. woody plants typically less than 50 cm tall).
- Exotic species: the percentage cover of non-native perennial plant species does not exceed the percentage cover of native plant species (annual or perennial) in the ground layer.

The TEC was assessed when coolabah dominant vegetation communities were encountered.

A total of five Coolibah TEC assessments have been undertaken during surveys across the Project Area.

Poplar Box TEC

The *Commonwealth Listing Advice* (Department of the Environment and Energy, 2019) outlines the key diagnostic and condition threshold criteria for the Poplar Box TEC. TEC assessments for the community include both a desktop component (to identify potential corresponding REs) and field validation to determine whether the key diagnostic criteria outlined in are met, as outlined in **Table 4.3**.

The field validation involved collecting the following data within Poplar Box communities:

- RE analogous to Poplar Box TEC
- community structure
- tree crown cover
- proportion of Poplar Box in canopy
- mid-layer (1–10 m) crown cover of shrubs and small trees
- perennial native vegetation cover in ground layer (< 1 m)
- number of native plant species in the ground layer (< 1 m)
- number of large Poplar Box (or hybrids) per hectare (≥ 30 cm DBH and / or hollows present)
- evidence of Poplar Box recruitment.

A total of three Poplar Box TEC assessments have been undertaken during the surveys across the Project Area.

Table 4.3 Condition Classes for Poplar Box TEC

Category	Native cover and diversity thresholds	Minimum patch size thresholds
Class A Highest Quality		
Category A1 **Little to no perennial weeds and diverse native understorey**	The crown cover of canopy trees in the patch is ≥ 10% AND ≥ 90% of perennial vegetation cover in the ground layer is native AND ≥ 30 native plant species per patch in the ground layer	≥ 1 ha

Category	Native cover and diversity thresholds	Minimum patch size thresholds
Category A2 **A large patch with low perennial weeds and diverse native understorey**	The crown cover of canopy trees in the patch is ≥10% AND ≥70% of perennial vegetation cover in the ground layer is native AND ≥ 30 native plant spp. Per patch in the ground layer	≥ 5 ha
Class B Good Quality		
Category B **A large patch with good quality native understorey or with mature trees**	The crown cover of canopy trees in the patch is ≥10% AND ≥ 50% of perennial vegetation cover in ground layer is native AND EITHER ≥ 20 perennial native plant species per patch in the ground layer OR ≥ 10 mature trees per ha with ≥ 30 cm DBH (and/or hollows)	≥ 5 ha
Class C Moderate Quality		
Category C **A large patch with low native cover but retains good native understorey diversity and habitat features of mature trees**	The crown cover of canopy trees in the patch is ≥10% AND If < 50% of perennial vegetation cover in ground layer is native, then the patch must have: ≥ 20 native plant spp. Per patch in the ground layer AND ≥ 10 mature trees per ha with ≥ 30 cm DBH (and/or hollows) AND smaller trees, saplings or seedlings suggestive of periodic recruitment	≥ 5 ha

4.3.3 Threatened Flora

Across the field survey program, targeted searches for threatened flora species have been undertaken opportunistically by Umwelt, Eco Logical Australia, GreenTape Solutions and 28 South where suitable habitat has been identified. If threatened flora species were found, their location and spatial extent were recorded, notes regarding population size and photographs were also collected.

Three surveys have also been completed by Otto Agribusiness (2019–2020) within the Project Area specifically targeted the presence of threatened flora species. On these surveys, the Botanical Systematic Transect Search method was employed, which involved recording and identifying every plant within a 100 m x 10 m plot. Photographs along with the global positioning system (GPS) coordinates are taken at either end of transect. Across the three surveys, a total of 79 threatened flora transects were conducted.

4.3.4 Terrestrial Fauna

4.3.4.1 Habitat Characterisation Assessments

Habitat assessments which characterise fauna habitat values were undertaken within all representative vegetation types supported by the Project Area. The habitat assessments followed guidance outlined by Eyre *et al.* (2018), recording information on the location, landform, vegetation structure, regional ecosystem, and disturbance characteristics of sites in a standardised manner. Microhabitat features such as coarse woody debris, tree hollows, mistletoe, soil cracking and leaf litter were also documented.

Targeted habitat assessments were undertaken to identify the extent, condition and value of habitat within the Project Area, and as such, the likely occupancy/useability of these habitats by target threatened fauna species, in terms of breeding, shelter, roosting, foraging and dispersal. These assessments informed site selection, informing suitable areas for targeted field surveys (i.e. active searches or spotlighting). They were conducted for potentially occurring threatened species, as identified during the desktop assessment, focussing on specialist habitat requirements collecting information derived from available literature (including the SPRAT Database, relevant Government documents and published research papers) and vegetation assessments conducted in the field. A total of 223 habitat assessments have been completed including approximately 104 targeted. Locations of habitat assessment sites are depicted on **Figure 4.1**.

4.3.4.2 Diurnal Birding and Opportunistic Sightings

Roaming/meandering bird surveys using both visual and auditory identification were conducted within all habitat types across the field survey program. Active birding was also completed at farm dams and watercourses where accessible. All fauna observed incidentally throughout the Project Area were recorded.

4.3.4.3 Habitat Quality Assessments

Habitat quality assessments were undertaken in accordance with the *Guide to Determining Terrestrial Habitat Quality (Version 1.2)* (Department of Environment, Science and Innovation, 2020) as per Project-specific guidance provided by DCCEEW. A total of 18 habitat quality assessments were conducted in representative areas of ornamental snake (*Denisonia maculata*) and koala (*Phascolarctos cinereus*) habitat (**Figure 4.1**) and included the following assessments:

- Landscape-scale attributes – describes the surrounding landscape of the subject area, and the influence this has on the vegetation quality.
- Site-based attributes – provide an indication of the general vegetation condition of an area.
- Species habitat attributes – determine the ability of an area to support a particular fauna species based on that species' specific habitat requirements.

Prior to the habitat quality assessment surveys, the matter unit (MU) and assessment unit (AU) were delineated and mapped to inform field survey and ensure adequate sampling replication throughout the Project Area where significant residual impacts may occur on MUs.

Delineation of units followed:

- MU – being the habitat utilisation type of the target MNES matter, i.e. koala breeding and foraging habitat and shelter habitat.
- AU – Condition types mapped within the mapped area of the MU. i.e. remnant vegetation comprising koala breeding and foraging habitat.

The MUs were delineated within the Project Area as per Habitat Modelling Rules (**Appendix C**).
These assessment methodologies are discussed in detail in the sections below.

Landscape-scale attributes

As the Project Area is located within a 'fragmented landscape', the landscape surrounding the Project Area and its influence on the site's vegetation quality is measured via assessment of the following four attributes:

- size of patch
- context
- connectivity
- ecological corridors.

The assessment of landscape-scale attributes was undertaken in a desktop setting as per the *Guide to Determining Terrestrial Habitat Quality (Version 1.2)*, which refers to the methodology described in the *BioCondition Assessment Manual* (Eyre *et al.*, 2015). A landscape-scale attribute numerical score out of 20 was generated.

Site-based attribute assessments

Site-based attribute assessment was undertaken as per the *Guide to Determining Terrestrial Habitat Quality (Version 1.2)*, which refers to the methodology described in the *BioCondition Assessment Manual* (Eyre *et al.*, 2015). A total of 18 BioCondition assessments involved the collection of the following 13 site-based attributes within a 100 m x 50 m nested sampling plot:

- recruitment of species in the ecologically dominant layer
- native tree species richness
- native shrub species richness
- native grass species richness
- native forb species richness
- tree canopy height
- tree canopy cover
- shrub canopy cover

- native perennial grass cover
- organic litter cover
- number of large trees
- coarse woody debris abundance
- non-native plant cover.

Species habitat attribute assessments

Species habitat quality attributes are designed to assess the capacity of a habitat area to support a species for all or part of its life. Species specific habitat requirements were researched using available literature and the knowledge of experienced, suitably qualified ecologists for each potentially occurring threatened species (as determined by the desktop assessment in **Section 4.1**).

Species habitat quality assessments were also completed at each site-based attribute assessment site. As part of these assessments, three measurable habitat attributes were assessed against a series of species-specific environmental indicators. Each environmental indicator was assigned a score from 0–25, where 0 represents the lowest quality and/or availability, and 25 represents the highest quality and/or availability.

Measured habitat attributes included:

- Quality and availability of food and habitat required for foraging.
- Quality and availability of habitat required for shelter and breeding.
- Quality and availability of habitat required for mobility.

In addition to the above, the habitat was also assessed for the absence of threats. Each identified threat was assessed according to scope and severity against the threat matrix, provided in the *Guide to determining terrestrial habitat quality* (Department of Environment, Science and Innovation, 2020). Threats were assessed on the following principles:

- Scope of threats regarding what percentage of the population or habitat within the matter area will be affected over the next 10 years or three generations.
- Low scores reflect higher percentage (80–100%) of population or habitat being destroyed while high scores are assigned where a smaller portion (1–19%) of habitat or population is slightly degraded or negligibly affected.
- Severity of threat assesses what percentage for the population, or its habitat will be affected by the threat.
- Low scores being allocated when 80–100% of the population or its habitat will be affected, and high scores being allocated when the threat is negligible and will affect only a small proportion (1–5%) of a species habitat or population.

Species habitat attributes and threats have been scored in line with assessments of the potential offset site. See the Project's Offset Area Management Plan (Attachment E of the PD) for further information including habitat scoring criteria and justification.

4.3.5 Threatened Fauna Targeted Surveys

4.3.5.1 Nocturnal Survey 2020

A nocturnal fauna field survey was undertaken within the Project Area by two suitably qualified ecologists over 5 days from 23 to 27 March 2020, targeting ornamental snake as well as koala (*Phascolarctos cinereus*) and greater glider (southern and central) (*Petauroides volans*). The survey was undertaken following heavy rainfall to coincide with a peak in prey activity resulting in likely higher detectability of ornamental snakes. The field survey was focused to thirteen monitoring sites located across 10 properties, known or likely to support suitable habitat for the target species as identified from desktop assessment.

The field survey was primarily undertaken in accordance with the *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (Department of Climate Change, Energy, the Environment and Water, 2023a), and the *Survey Guidelines for Australia's Threatened Reptiles* (Department of Climate Change, Energy, the Environment and Water, 2023a). These guidelines recommend:

- Targeting water-inundated gilgais, wetlands, riparian habitats, and the surrounding environment (e.g., roads) and large logs between dusk and early morning hours.
- Surveying over a minimum of 1.5 person hours per hectare for habitats of average complexity per targeted species. Surveys should be conducted over a minimum of 3 nights.

Guidance outlined in the *Survey Guidelines for Australia's Threatened Mammals* (Department of Sustainability, Environment, Water, Population and Communities, 2011) was also considered to ensure the survey plan and effort was also appropriate for threatened arboreal mammals.

The survey involved spotlighting at night and active searches during the day. At each site, species-specific habitat assessments were also recorded to characterise the habitat and understand the presence and abundance of key habitat resources and likely habitat utilisation. Outside of these monitoring sites, several additional habitat assessments were undertaken to assess the quality and suitability of other habitats across the Project Area. These sites were selected to represent the variability in habitat quality identified during the field survey. Spotlighting and active search sites are depicted on **Figure 4.1**, with survey effort per method outlined in **Table 4.4** below**.**

Table 4.4 Active Search and Spotlighting Survey Effort

Method	Total Effort (hrs / sites)
Active Searches	12.75 / 13
Spotlighting	20.75 / 13

4.3.5.2 Ornamental Snake Habitat Survey 2023

An additional field survey was undertaken within the Project Area by two suitably qualified Umwelt ecologists over 5 days from 12 to 16 June 2023 with the objective of increasing the field validation of ornamental snake habitat. As surveys were not conducted with the objective of detecting the species, survey timing was considered appropriate for the scope of works.

The aim of the survey was to enhance additional species-specific habitat assessment information and refine habitat mapping extents (where required). The field survey was not exhaustive, rather targeted, focusing on properties that supported representative habitat of the broader area in line with the previous targeted survey. Properties which were identified as being a potential location for petroleum activities were preferentially targeted. Land parcels accessed for the field survey included: 37DW485, 39RP881508, 53CP903928, 1RP619647, 2RP881280, 1CP849908 and 46DW145.

The primary survey method employed was species-specific habitat assessments, which involved characterising the vegetation community and assessing the following key habitat features (at a minimum):

- presence and extent of gilgai
- gilgai characteristics including shape and depth
- soil type and presence of cracks
- ground litter and surface rocks
- logs and coarse woody debris
- native and exotic grass
- wetland indicator plants.

Rapid assessments of vegetation, habitat or habitat features and land use were also captured. Field survey sites are included on **Figure 4.1**.

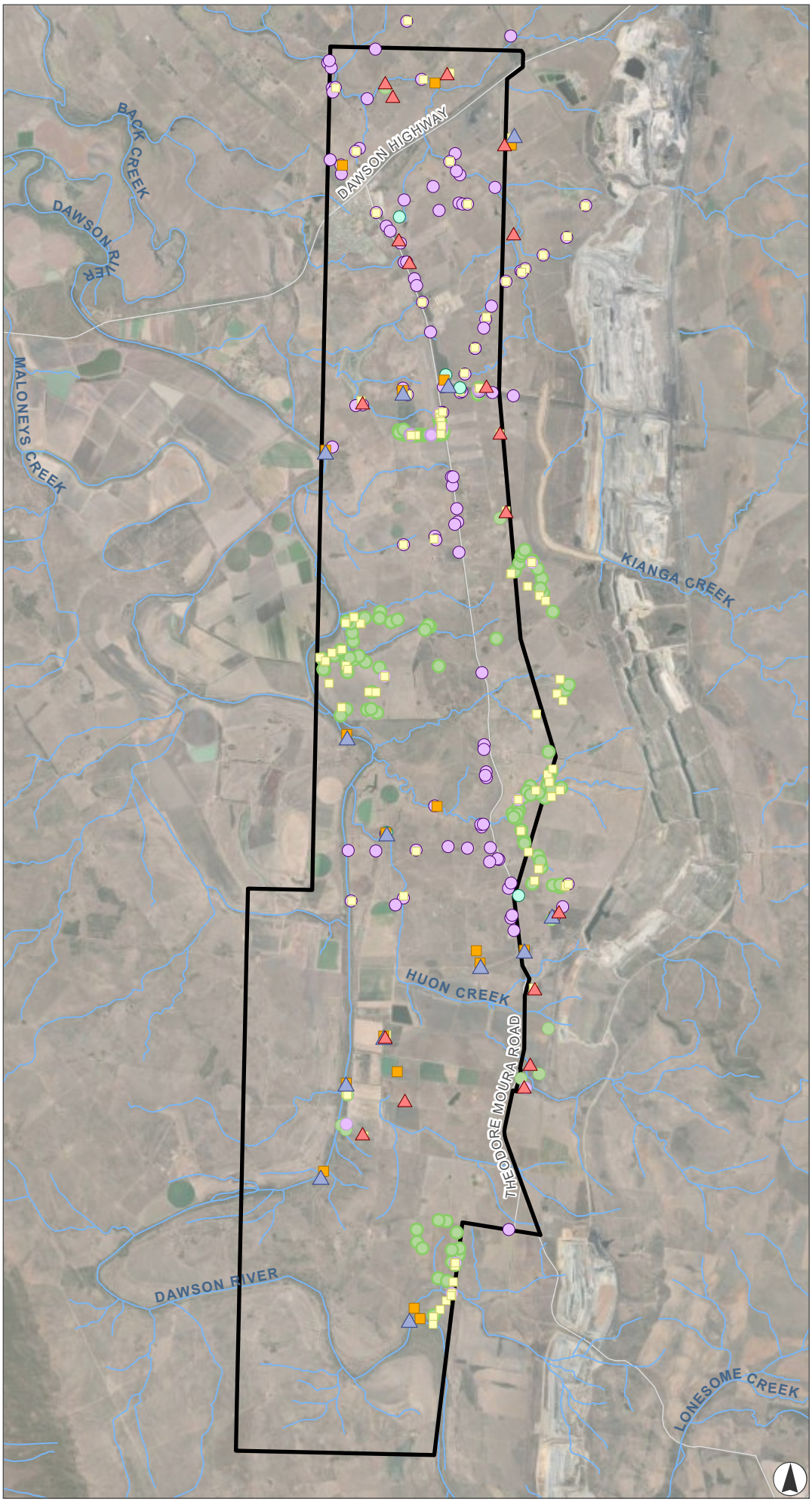

FIGURE 4.1

Umwelt Field Survey Sites 2019/2020, 2023 and 2024

Legend

- Watercourse
- Roads
- Project Area

Field Survey Sites

- Quaternaries
- Tertiary Sites
- Habitat Assessments
- Rapid Vegetation/Habitat Assessments
- Spotlighting Sites
- Active Search Sites
- Habitat Quality Assessment Sites



0 2 4 6

Kilometres

Scale 1:150,000 at A4
GDA2020 MGA Zone 55

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4.3.6 Combined Survey Effort

Database searches completed as part of the initial desktop assessment identified a number of threatened and migratory fauna species as potentially occurring within the Project Area. Some of these species were the subject of targeted survey effort within representative habitat types. Species not targeted during the field survey were those found to have no records in the desktop search extent, no suitable habitat within the Project Area or do not have a distribution that overlays the Project Area. Whilst these species were not specifically targeted, other survey techniques employed for the potentially occurring species are likely to have been suitable at detecting presence and suitable habitat.

Survey techniques employed to target threatened species were determined based on the DCCEEW survey guidelines for Australia's threatened fauna, referral guidelines and recently published literature, that was available at the time of the surveys. Surveys were undertaken in accordance with the following resources:

- *Survey Guidelines for Australia's Threatened Mammals* (Department of Sustainability, Environment, Water, Population and Communities, 2011).
- *Survey Guidelines for Australia's Threatened Birds* (Department of Environment, Water, Heritage and the Arts, 2010).
- *Survey Guidelines for Australia's Threatened Reptiles* (Department of Sustainability, Environment, Water, 2011).
- *Draft Referral Guidelines for nationally listed Brigalow Belt reptiles* (Department of Climate Change, Energy, the Environment and Water, 2023a).
- *Draft referral guideline for the 14 birds listed migratory under the EPBC Act* (Department of the Environment, 2015).
- *Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (Department of the Environment and Energy, 2017).
- *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland Version 4* (Eyre, Ferguson, *et al.*, 2022).

In lieu of Commonwealth survey guidelines, survey techniques employed to target EPBC Act listed flora species reflect those endorsed by the QLD government (Flora Survey Guidelines – Protected Plants Department of Environment and Science, 2019b) including opportunistic searches in suitable habitat.

All guidelines listed above provide a recommended standardised method of collecting ecological data, generally across smaller sized project sites (i.e. < 50 ha). They are broad guidelines and do not factor in quality of habitat and other site-specific information that may influence presence and the suitable level of survey effort that is practical to implement.

Where practical, the survey guidelines above have been met as detailed below in **Table 4.5**. Where survey guidelines have only partially been met due to their impracticality at this scale, effort is still considered sufficient due to the nature of the Project Area and the adoption of other techniques such as habitat assessments where presence of suitable habitat resources has been used as a surrogate for presence.

Additional survey effort relevant to threatened species and communities will also be gained during the future scouting surveys required for the Project, as described in the Protocol (Attachment C of the PD).

Table 4.5 Combined Survey Effort and Overall Adequacy

MNES	Relevant Guidelines	Recommended Methodology	Total Survey Effort Undertaken	Survey Adequacy
Threatened Ecological Communities (TECs) including Brigalow (Acacia harpophylla dominant and co-dominant) TEC,	*Approved Conservation Advice for the Brigalow (Acacia harpophylla dominant and co-dominant) ecological community* (Department of the Environment, 2013)	Per patch assessments that consider both key diagnostic and condition criteria as per the relevant guideline.	A total of 59 TEC assessments have been completed within the Project Area, including 51 brigalow assessments, five coolibah assessments and three poplar box assessments. The number of assessments reflects the relative frequency in which analogous REs have been encountered within the Project Area. Refined vegetation mapping (see **Section 4.4.1**) has also contributed to the identification of potential TEC areas, ensuring smaller patches of vegetation and areas of regrowth, possibly not in the State mapping are captured.	**Requirements met** Surveys have consistently employed the recommended survey method. Where field validation has not occurred and the potential presence of analogous REs is identified, TECs have been assumed present. Future field scout assessments will continue to assess the presence and extent of TECs.
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions TEC	*Commonwealth Listing Advice on Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions* (Threatened Species Scientific Committee, 2011)			
Poplar Box Grassy Woodland on Alluvial Plains TEC	*Conservation Advice (including listing advice) for the Poplar Box Grassy Woodland on Alluvial Plains* (Department of the Environment and Energy, 2019)			

MNES	Relevant Guidelines	Recommended Methodology	Total Survey Effort Undertaken	Survey Adequacy
Threatened flora species including *Solanum johnsonianum*, *Solanum dissectum* and *Xerothamnella herbacea*	There are no Commonwealth-approved species-specific survey guidelines	Although there is no specific methodology recommended, the following is noted in regard to identification of the species: • Flowering of *Solanum johnsonianum* has been recorded in March-June and August-September. Fruiting has been recorded in April and May. *S. johnsonianum* is considered to be most closely related to *S. nemophilum* and *S. innoxium*. It differs from the former by the lack of glandular hairs on the upper leaf surface as well as in characteristics of the stellate hairs and from the latter by wider leaves, longer petioles and sometimes by the presence of gland-tipped stellate hairs on the calyx. • *Solanum dissectum* flowers July to November and fruits from March to July. *S. dissectum* is most closely related to S. ferocissimum and the recently described S. lythrocarpum. It differs from both species by its complete lack of stellate hairs and its deeply lobed leaves. • *Xerothamnella herbacea* flowers are small, bright pink to mauve, two lipped, to 6.5 mm long, and occur in the upper leaf axils. The fruits are club-shaped, 9 mm long and sparsely glandular hairy.	Targeted searches for the species were completed throughout the field survey program, including during the flowering and fruiting periods for each species. Searches generally comprised opportunistic and random walking meanders in areas of suitable habitat. Searches were undertaken across all survey days throughout the program including at the 23 secondary, 32 tertiary and 332 quaternary sites. Surveys conducted by Otto agribusiness in 2019 and 2020 were specific to threatened flora and included a total of 79 threatened flora transects.	**Effort considered adequate** Although there are no guidelines specifying appropriate survey techniques or effort for the listed species, survey effort undertaken is considered sufficient and included sampling within the species' fruiting period. It is considered reasonable that any populations present within the Project Area would be detected given the effort undertaken.

MNES	Relevant Guidelines	Recommended Methodology	Total Survey Effort Undertaken	Survey Adequacy
Squatter pigeon (southern) (*Geophaps scripta scripta*) White-throated needletail (*Hirundapus caudacutus*) Australian painted snipe (*Rostratula australis*)	In lieu of species-specific guidelines, surveys for all bird species were undertaken in consideration of the *Survey guidelines for Australia's threatened birds* and the *Terrestrial Vertebrate Fauna Survey Guidelines for QLD*.	• Area searches for the species in representative habitat or transect surveys. Recommended effort is 15 hours over 3 days within an area of 50 ha. Or six x 5–10 minute searches within an area of 1 ha. Longer surveys may be required in complex habitats. • Flushing surveys. Recommended effort is 10 hours over 3 days within an area of 50 ha. • Waterhole searches: Survey effort not specified. • Surveys to be undertaken during peak bird activity. • Area searches involving systematically searching for birds and signs of their presence (e.g. nesting habitat), as well as listening for their calls.	Methods relevant to the detection of the target species were employed during 11 field surveys undertaken between 2019 and 2024, including: • 223 habitat assessments, which included searches for birds and/or signs of their presence. • 240 person-hours of diurnal birding. Of the 11 surveys, four occurred in spring/summer, four occurred in early autumn and three occurred in winter.	**Requirements met** Surveys employed relevant methodologies across all seasons including high activity periods. Sampling has occurred over several years, allowing for a range of climatic conditions which could influence presence and abundance to be assessed. A precautionary approach has been adopted in the habitat mapping and the presence of microhabitat features has been assumed in areas of potentially suitable habitat. Survey effort is considered adequate for the purposes of this assessment.
Painted honeyeater (*Grantiella picta*)	*Targeted species survey guidelines for painted honeyeater* (Rowland, 2012).	• Area searches (during breeding season, early spring to late summer) involve systematically searching for birds and signs of their presence (e.g. nesting habitat), as well as listening for their calls. Surveys for the painted honeyeater should concentrate on woodland where mistletoe is abundant (particularly when in fruit). Recommended minimum effort is 4 hours over 4 days but note that detectability during the breeding season is very different to the non-breeding season.		

MNES	Relevant Guidelines	Recommended Methodology	Total Survey Effort Undertaken	Survey Adequacy
Greater glider (southern and central) (*Petauroides volans*) Yellow-bellied glider (south-eastern) (*Petaurus australis australis*)	In lieu of species-specific guidelines, surveys for these species were undertaken in consideration of the *Survey guidelines for Australia's threatened mammals* and the *Terrestrial Vertebrate Fauna Survey Guidelines for QLD*.	• Arboreal mammal survey methods outlined in the *Survey guidelines for Australia's threatened mammals* include: ○ Diurnal searches for the presence of potentially suitable habitat resources for nest or den sites as well as signs of the species' presence, such as scratches on tree trunks and scats beneath trees. ○ Stag watching. ○ Spotlight surveys in suitable vegetation types. ○ Call detection and/or call playback surveys for vocal species, in addition to playback of the calls of owl predators that are known to induce a call response. ○ Cage trapping. • As per *Terrestrial Vertebrate Fauna Survey Guidelines for QLD*: ○ Spotlighting transects are the most effective method. ○ Survey effort should target habitat known to be suitable for listed species.	A total of 223 habitat assessments, which included searches for arboreal mammals and/or signs of their presence, have been undertaken across the Project Area between 2019 and 2024. Spotlighting searches were also conducted across five nights in March 2020. It is acknowledged that spotlighting targeted a variety of habitat types and thus approximately half of the total spotlighting effort is considered relevant to this species (10.4 person-hours of spotlighting).	**Requirements partially met** Surveys employed relevant methodologies across all seasons including high activity periods (temperatures in March generally between 19 and 32 degrees). Survey effort is considered adequate for the purposes of this assessment, noting the limited availability of habitat present within the main extent of the Project Area (where the Project will occur). Field survey findings support the conclusion that suitable habitat is restricted to the riparian zones of the Dawson River. A precautionary approach has been adopted in the habitat mapping and the presence of microhabitat features has been assumed in areas of potentially suitable habitat.

MNES	Relevant Guidelines	Recommended Methodology	Total Survey Effort Undertaken	Survey Adequacy
Koala (*Phascolarctos cinereus*)	*A review of koala habitat assessment criteria and methods* (Youngenbob, Marsh and Skewes, 2021).	No specific methodology or effort standards are prescribed for koala surveys. However, where there is a need to critically evaluate the potential impacts of major projects, multiple techniques should be used. Repeat surveys may be necessary to take temporal variation into account. • Direct observation methods include transect and point surveys, spotlighting, mark-resight or mark-recapture, thermal detection drones, radio-tracking, camera traps and detection dogs. • Indirect methods include scratchings, Spot Assessment Technique (SAT) and other scat search methods, call playback, passive acoustics and landscape nutritional quality surveys. To optimise detection, call playback surveys should be conducted at night during the breeding season, and in the absence of strong winds or rain. Indirect methods are reported to be often the most effective for gathering presence/absence data due to the difficulty in observing koalas and the variable density of koalas across the landscape.	A total of 223 habitat assessments, which included searches for koalas and/or signs of their presence, have been undertaken across the Project Area between 2019 and 2024. Spotlighting searches were also conducted across five nights in March 2020. It is acknowledged that spotlighting targeted a variety of habitat types and thus approximately half of the total spotlighting effort is considered relevant to this species (10.4 person-hours of spotlighting).	**Requirements met** As recommended, the field survey program employed both direct and indirect methods, including within the months when activity is generally highest. Targeted survey methods employed include spotlighting. Although not all recommended methods have been employed, survey effort is considered sufficient for the purposes of this assessment.

MNES	Relevant Guidelines	Recommended Methodology	Total Survey Effort Undertaken	Survey Adequacy

Ornamental snake (*Denisonia maculata)*	*Draft Referral Guidelines for nationally listed Brigalow Belt reptiles* and *Survey Guidelines for Australia's Threatened Reptiles.*	• One-off diurnal search:
		  ○ Active searches of microhabitat for 1.5 hours in each hectare of suitable habitat.
		  ○ A minimum of 3 days with 1 repeat (6 days).
		• Spotlighting:
		  ○ 1.5 hours in each hectare of suitable habitat.
		  ○ A minimum of 3 nights.
		• Pitfall and funnel trapping:
		  ○ 6 x 20 L buckets along a 30 m drift fence.
		  ○ 2 replicates per habitat type, morning and evening checks over 4 days.
		• Opportunistic surveys of roads.
			A total of 223 habitat assessments, which included searches for key microhabitat features (i.e. gilgai, soil cracks, woody debris), the species and frogs/frog habitat, have been undertaken across the Project Area between 2019 and 2024. Targeted survey effort was undertaken in March 2020 including 20.75 person-hours of spotlighting across five nights (including along tracks and roads) and 12.75 person hours of active diurnal searches. Inclusive of effort completed during habitat assessments, the total active diurnal search effort equates to approximately 68.5 person hours.	**Requirements partially met**
				Surveys employed relevant methodologies (direct and indirect) across all seasons including high activity periods (temperatures in March generally between 19 and 32 degrees). Recommended spotlighting effort per ha is not practical given the size of the Project Area. Sampling of habitat has occurred over several seasons (and years), allowing for a more thorough understanding of habitat resource availability over time. Although not all recommended methods have been employed, survey effort is considered sufficient for the purposes of this assessment.

MNES	Relevant Guidelines	Recommended Methodology	Total Survey Effort Undertaken	Survey Adequacy
Yakka skink (*Egernia rugosa*)	*Draft Referral Guidelines for nationally listed Brigalow Belt reptiles* and *Survey Guidelines for Australia's Threatened Reptiles.*	• Diurnal active searches over a minimum of 1.5 person hours per hectare, surveying over minimum 3 days. • Transects positioned in large habitat patches (>10 ha) to sample microhabitats in each habitat type. • Spotlighting targeted habitat, over a minimum of 1.5 person hours per hectare over a minimum of 3 nights. • One large Elliott-style trap (15.5 cm x 15 cm x 46 cm) and one cage trap placed as close as possible to burrow entrances, check every morning and early evening over four days. • Elliot traps, camera traps and funnel traps to be used around burrows or colonies.	A total of 223 habitat assessments, which included searches for key microhabitat features (i.e. large fallen logs) and signs of yakka skink presence (i.e. burrow systems and communal defecation sites/latrines), have been undertaken across the Project Area between 2019 and 2024. In March 2020, a total of 12.75 person-hours of diurnal active searches and 20.75 person-hours of spotlighting across five nights was also conducted in March 2020. Inclusive of effort completed during habitat assessments, the total active diurnal search effort equates to approximately 68.5 person hours.	**Requirements partially met** Surveys employed relevant methodologies across all seasons including high activity periods. While Elliot trapping has not been undertaken, habitat assessments combined with active diurnal searches were conducted across a range of suitable habitat types during all surveys. Further, searching for burrow systems and communal defecation sites is stated to be the most reliable method of detection (Department of Sustainability, Environment, Water, 2011). Survey effort is considered adequate for the purposes of this assessment.
White-throated snapping turtle (*Elseya albagula*) Fitzroy River turtle (*Rheodytes leukops*)	*Survey Guidelines for Australia's Threatened Reptiles.*	• Diving with a face mask and snorkel: no minimum effort identified. • Seine netting: no minimum effort identified. • Yabby traps: no minimum effort identified.	Habitat assessments have been completed at watercourses across the Project Area including at several locations along the Dawson River. No aquatic trapping survey has been undertaken. In recognition of the difficulties with detecting these species, the precautionary principle has been adopted and the species are assumed to be present.	**Requirements not met but considered sufficient** While species-specific targeted methods have not been employed, habitat assessments have been conducted during all surveys. A precautionary approach has been adopted in the habitat mapping and the presence of microhabitat features has been

MNES	Relevant Guidelines	Recommended Methodology	Total Survey Effort Undertaken	Survey Adequacy
Boggomoss snail (*Adclarkia dawsonensis*)	No species-specific survey guidelines for *Adclarkia* exist.	• Diurnal active searches involving rolling logs/rocks and other ground debris, raking leaflitter and dismantling bark piles. • Soil/leaflitter samples (minimum 1.0 L) taken to search for juveniles or shell fragments. • Microhabitat assessments.	No targeted survey has been undertaken. In recognition of the difficulties with detecting these species, the precautionary principle has been adopted and the species are assumed to be present.	assumed in areas of potentially suitable habitat. All field validated data supports the finding that habitat for these species within the Project Area is limited to a single location (the Dawson River or part of). As such, survey effort is considered adequate for the purposes of this assessment.
Migratory terrestrial birds: Fork-tailed swift (*Apus pacificus*), oriental cuckoo (*Cuculus optatus*) and rufous fantail (*Rhipidura rufifrons*)	*Draft referral guideline for the 14 birds listed migratory under the EPBC Act.*	• 2 ha survey in 20 minutes over sufficient survey plots to estimate a density, and hence the population size across the proposed development area. • Standardised timed periods.	Methods relevant to the detection of the target species were employed during 11 field surveys undertaken between 2019 and 2024, including: • 223 habitat assessments, which included searches for birds and/or signs of their presence. • 240 person-hours of diurnal birding. Of the 11 surveys, four occurred in spring/summer, 4four occurred in early autumn and four occurred in winter.	**Requirements met** Surveys employed relevant methodologies across all seasons including high activity periods. Sampling has occurred over several years, allowing for a range of climatic conditions which could influence presence and abundance to be assessed. Survey effort is considered sufficient for purposes of this assessment, considering the conservative approach undertaken when determining the likelihood of occurrence.

MNES	Relevant Guidelines	Recommended Methodology	Total Survey Effort Undertaken	Survey Adequacy
Migratory wetland birds: Common sandpiper (*Actitis hypoleucos*), Sharp-tailed sandpiper (*Calidris acuminata*), Pectoral sandpiper (*Calidris melanotos*), Latham's snipe (*Gallinago hardwickii*), Caspian tern (*Hydroprogne caspia)* and Glossy ibis (*Plegadis falcinellus)*	*Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species.*	• Bird surveys in suitable habitat: ○ 1 x survey in December. ○ 2 x surveys in January. ○ 1 x survey in February.	Methods relevant to the detection of the target species were employed during 11 field surveys undertaken between 2019 and 2024, including: • 223 habitat assessments, which included searches for birds and/or signs of their presence. • 240 person-hours of diurnal birding. Of the 11 surveys, 4 occurred in spring/summer, 4 occurred in early autumn and 3 occurred in winter.	**Requirements met** Surveys employed relevant methodologies across all seasons including high activity periods. Sampling has occurred over several years, allowing for a range of climatic conditions which could influence presence and abundance to be assessed. A precautionary approach has been adopted in the habitat mapping and the presence of microhabitat features has been assumed in areas of potentially suitable habitat. Survey effort is considered adequate for the purposes of this assessment.

4.3.7 Survey Limitations

Recognising the very large size of the Project Area, this assessment has been completed using a combination of field-validated data, desktop information and extrapolated field survey results. Data has been collected between 2013 and 2024, however only data from 2018 onwards has been considered relevant in terms of overall survey effort. Nonetheless, the results are dependent on the level of accuracy and detail associated with this information. Visual interpretation of aerial imagery was required for the purposes of mapping and is thus somewhat subjective.

Ecological field surveys have inherent limitations associated with natural variation, seasonal constraints and accessibility. Land access restrictions for some land parcels meant that ecological values could only be observed from public road easements. As a result, values such as the presence of threatened flora were unable to be confirmed for parts of the Project Area. Sampling locations for the Umwelt 2019 ecology assessment were situated within representative samples of vegetation communities. Flora surveys undertaken within one season cannot account for the entire flora present in one location.

Fauna surveys are subject to inherent limitations in the detection success of targeted species, often resulting in a degree of false-absence records (i.e. a species is present, but not detected). Relevant guideline documents, such as the *Terrestrial Vertebrate Fauna Survey Guidelines for QLD* (Eyre *et al.*, 2018), specify baseline surveys should be conducted over multiple seasons (spring and autumn for the Brigalow Belt). The aims of the ecology assessment (Umwelt 2019) were not to complete baseline inventory surveys, but rather identify areas of ecological value for Project avoidance, inform future survey/ approvals and complete targeted surveys for MNES where required. The Umwelt 2020 targeted fauna survey was undertaken following heavy rainfall to coincide with a peak in prey activity resulting in higher detectability of ornamental snakes.

4.4 Data Analysis and Mapping

4.4.1 Refined Vegetation and Habitat Map

A refined vegetation community and habitat map was developed for the Project Area using the ESRI Geographic Information Systems (GIS) program ArcGIS Pro. The mapping was progressively updated as new data became available throughout the field survey program. As well as field-validated data, the map was informed by desktop layers including State vegetation mapping (RE and pre-clear REs), Dawson Valley soil mapping, contour mapping (1 m and 10 m interval), LiDAR ground-return point data.

In contrast to the scale utilised to develop the State RE map (1:100,000, providing a positional accuracy of 100 m), a substantially finer scale of 1:5,000 was employed in order to capture vegetation patches ≥0.5 ha in size, which may comprise still TEC or habitat for a listed species.

Where already captured in the State RE map, polygon RE attributes and boundaries were revised to reflect collected floristic field data and patterns observable in aerial imagery. Areas that were not accessed during the field surveys were mapped or refined using aerial imagery and extrapolated field data, where reasonable. In order to understand potential differences in vegetation age and clearing activity, current imagery from a variety of sources (i.e. ESRI, QLD Globe and Google) as well as historical imagery (QImagery) was reviewed. In certain locations within the Project Area, mapping has not been refined due to the lack of survey sites within and nearby (i.e. is reflective of the State RE map alone).

Using habitat assessment data collected during the field surveys, terrestrial habitat types were then assigned to the refined vegetation polygons. Where mapping has not been refined, heterogenous polygons were categorised for habitat using the dominant RE.

4.4.2 MNES Habitat Mapping

Following the completion of the likelihood of occurrence assessment and the vegetation communities mapping, mapping for the MNES values 'known' or considered to have a 'high' or 'moderate' likelihood of occurrence within the Project Area was undertaken.

Mapping rules were developed for each value, primarily based on habitat requirements as specified by SPRAT and/or available scientifically backed literature. As required, other publicly available datasets were also reviewed to inform the modelling rules including relevant species recovery plans (where available), referral guidelines, approved conservation advice and listing advice, management plans and peer-reviewed journal articles. Habitat assessments collected during the field surveys, species records (public and survey records), and Project vegetation mapping was used to map potential habitat per MNES according to the modelling rules.

Refined vegetation and habitat mapping was also edited in consideration of Westside existing infrastructure (re-assigned to 'non-remnant' and removed from habitat maps), since these areas are subject to ongoing maintenance activities.

Although REs form the basis of the terrestrial habitat types discussed in this assessment, the presence and abundance of required habitat resources (microhabitat features) as determined through field surveys was considered foremost when assessing if suitable for a particular MNES. MNES habitat mapping rules are provided in **Appendix C**.

4.4.2.1 Review of DES Potential Habitat Models

The Queensland government (Department of Environment, Science and Innovation, 2022) has developed potential habitat models for 134 Queensland threatened and priority fauna species using Maxent. A review of these models against Project habitat mapping and/or species records was completed for known and potentially occurring threatened fauna species with more complex habitat definitions, where available. While for some species the modelling has been used to further justify conclusions regarding mapping appropriateness or the degree of conservativism, no changes to the mapping were made based on this review.

The models are supported by an explanatory paper titled *Potential habitat modelling methodology* (Queensland Herbarium, 2021). As described in the methodology, potential habitat models aim to predict the probable distribution of suitable species habitat based on input variables likely to test their biological tolerance limits. Potential habitat models are unable to predict if the modelled habitat is currently occupied by that species and are not intended as a substitute for field survey by skilled observers. Potential habitat models inform species surveys, planning, management, and recovery.

Habitat modelling predicts the likelihood of an area being suitable for the species, ranging from <10 (highly unlikely to be suitable) to 90-100% (highly likely to be suitable). Vetted, post-1975 species presence records compiled by the Department of Environment and Science (now DESI) with a location precision of 2,000 m or better are utilised by the fauna models. Models are based on seven environmental layers: annual mean temperature, temperature seasonality (coefficient of variation), annual precipitation, mean moisture index of the lowest quarter moisture index, pre-clearing broad vegetation group (1:1M), land zone and terrain ruggedness. All models in this dataset have the equal training sensitivity and specificity logistic threshold applied. Pre-clearing vegetation is the vegetation prior to clearing and is reconstructed across Queensland based on interpretation of landscape as depicted on aerial photos or satellite imagery (Landsat, Spot), and ground-truthed using a sample of known points. Pre-clearing potential habitat models are clipped to Remnant Vegetation Cover 2019 to map potential habitat which remained as remnant vegetation in 2019.

Draft potential habitat models were assessed by experts for feasibility and to identify if any post-hoc refinement of the modelled distribution were required. Some species may be known with a high degree of confidence to have specific habitat requirements not incorporated into the development of the model. Where spatial products are available, e.g. discrete soil types, models can be clipped to produce a more refined product.

4.5 Significant Impact Assessment

The potential direct and indirect impacts on relevant MNES as a result of the Project have been assessed as per the *Significant Impact Guidelines 1.1 – MNES* (Department of the Environment, 2013b). Results of the likelihood of occurrence assessment were considered when assessing potential impacts, with only MNES 'known' to occur, or MNES with a 'high' or 'moderate' likelihood of occurring assessed.

Key terms used within significant impact criteria for listed TECs, threatened species and migratory species are defined by the *Significant Impact Guidelines 1.1 – MNES* as follows:

- Habitat critical to the survival of a species or ecological community refers to areas that are necessary:
    - for activities such as foraging, breeding, roosting, or dispersal
    - for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
    - to maintain genetic diversity and long-term evolutionary development, or
    - for the reintroduction of populations or recovery of the species or ecological community.
- Important population of a species refers to a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans and/or that are:
    - key source populations either for breeding or dispersal
    - populations that are necessary for maintaining genetic diversity, and/or
    - populations that are near the limit of the species range.

For some MNES, the key terms described above are already defined in the value's associated SPRAT profile, referral guideline, Listing Advice or Conservation Advice. Where this occurs, the specific definition is used in lieu of the above generic definitions.

5.0 Protected Matters Search Tool Results

Results from the PMST database search completed in February 2025 are presented below in **Table 5.1**. The search extent comprises the Project Area boundary with a 10 km buffer.

Table 5.1 PMST Search Results

MNES	PMST Report Result	Comments
World heritage properties	None	-
National heritage places	None	-
Wetlands of international importance (Ramsar)	None	-
Great Barrier Reef Marine Park	None	-
Commonwealth marine area	None	-
Listed threatened ecological communities	5	A detailed likelihood of occurrence assessment has been completed for these values in consideration of desktop and field survey results. See **Appendix B.**
Listed threatened species	36	
Listed migratory species	13	
Nuclear actions	NA	-
A water resource, in relation to coal seam gas development and large coal mining development	The Project is a coal seam gas development.	As per the EPBC referral, no significant impacts to groundwater or surface water have been identified (KCB Australia, 2021).

The PMST report identified some MNES values that were not initially assessed in the EPBC Act referral (2021/9117). Consultation with DCCEEW confirmed that the listing status under the EPBC Act is considered valid as of the referral decision date (30 June 2022). Therefore, any species that was listed under the EPBC Act before 30 June 2022 and had not undergone prior assessment has been included in this report. Conversely, species listed under the EPBC Act after 30 June 2022 have been excluded from assessment.

6.0 Description of Ecological Values

6.1 Environmental Context

6.1.1 Bioregion and Subregion

The Project Area is located within the Dawson River Downs subregion of the Brigalow Belt South Interim Biogeographic Regionalisation for Australia bioregion. This bioregion is broadly characterised by mixed eucalypt woodland with areas of brigalow (*Acacia harpophylla*) scrubs and open Mitchell grasslands. Cattle grazing is the major land use in the bioregion.

6.1.2 Soils and Geology

As per the detailed surface geology mapping (Department of Natural Resources and Mines, Manufacturing, and Regional and Rural Development, 2023), the majority of the Project Area geology is dominated by sedimentary rock. The lithological summary associated with this includes mudstone, sandstone, conglomerate, siltstone, oil shale, lignite and basalt. In association with the Dawson River and floodplain, detailed surface geology mapping maps the area as being dominated by rock type alluvium. The lithological summary includes clay, silt, sand and gravel, floodplain alluvial.

The soil and land use survey of part of the Dawson Valley was completed in 1957, where a total of 18 soil associations were identified across parts of the parts of the Baralaba, Monto and Mundubbera regions (Department of Natural Resources and Mines, Manufacturing, and Regional and Rural Development, 2007). The mapping is at a scale of 1:250,000 and is illustrated on **Figure 6.1**.

Within the Project Area, 16 soil groups are mapped, with two associated with gilgai depressions:

- Grey Gilgaied Clay Association: the most extensive soil group in the surveyed region, and is described as clay soils developed on a virtually flat landscape where there frequently being no drainage outlets for rainfall runoff so excess water merely collects in the deep gilgai depressions.
- Brown Gilgaied Clay Association: These soils are only found in the north-east of Moura and is described as brown clay soils with a strongly developed gilgai microrelief, with depressions ranging up to 3 feet [~91 cm] in depth.

The remaining soil associations are primarily clay groups, and one area in the centre of the Project Area mapped as a ‘swamp and wetland’ soil group.

Consistent with the above, the dominant soil type observed throughout the Project Area was heavy clay soils. These areas were either hosting brigalow communities or were considered likely to have hosted such communities previously, prior to broad scale land clearing. Alluvium was also present associated with the Dawson River, small tributaries and associated floodplains. To a lesser extent, fine grained sediments occurred on undulating plains.

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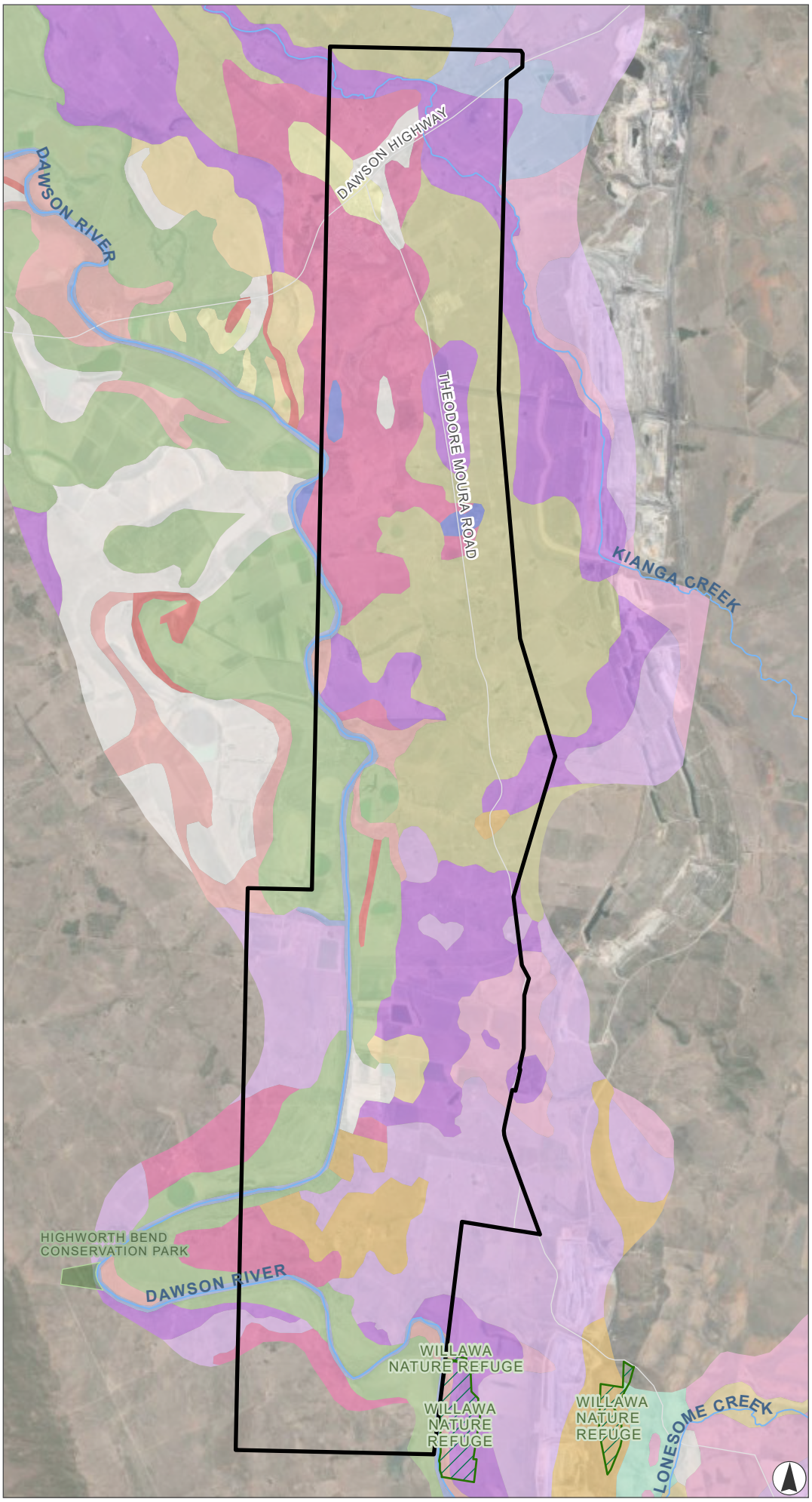

FIGURE 6.1

DoR Dawson Valley Soils Map - Ornamental snake Habitat Input

Legend

- Major Watercourse
- Roads
- Project Area
- Nature Refuge
- Protected Areas

DoR (2020) Dawson Valley Soils Map

- Black Earth Association
- Brown Clay Association
- Brown Gilgaied Clay Association
- Brown and Dark Grey Clay Catenary Association
- Coarser Textured Alluvial Soil Association
- Dark Grey Clay Association
- Dawson River
- Finer Textured Alluvial Soil Association
- Gleyed Podzolic Association
- Grey Gilgaied Clay Association
- Lateritic Red Earth Association
- Medium Textured Alluvial Association
- Shallow Stony Soil Association
- Solodized-Solonetz-Low Humic Gley Association
- Swamp and wetlands
- Weakly Solodized-Solonetz Association



0 2 4 6

Kilometres

Scale 1:150,000 at A4
GDA2020 MGA Zone 55

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Image Source: ESRI Basemap (2025) | **Data Source:** Umwelt (2025), DNRM (2025)

6.1.3 Existing Land Use

The Project Area is a brownfield site located in a rural part of central Queensland. The township of Moura occurs in the northern extent of the Project Area and supports approximately 1,843 people, as per the 2021 Australian Census. Anglo American Australia operate three open-cut coal mines that flank the entire length of the Project Area to the immediate east including the Dawson North, Dawson Central and Dawson South.

The majority of the Project Area is mapped as strategic cropping land (SCL), which is one of the four areas of regional interest under the State *Regional Planning Interest Act 2014*. SCL is land that is, or is likely to be, highly suitable for cropping because of a combination of the land's soil, climate and landscape features. The Project Area occurs wholly within the Central Highlands Isaac Western Cropping zone.

To support agricultural development, the Project Area has been subject to historical broad scale land clearing (as indicated by historical aerial imagery from 1953 onwards), with extensive areas cleared by 1965 (Q Imagery, 2024).

The Queensland Land Use (2021) mapping identifies several different land uses within the Project Area, with agricultural purposes (grazing and cropping) dominant. **Table 6.1** below provides a breakdown of the land uses by area, in levels aligned with the modified Australian Land Use and Management Classification (ALUMC, Version 8.0).

Table 6.1 Project Area Land Uses

Primary Land Use	Secondary Land Use	Area (ha)	Percentage (%) of Total Area
Conservation and Natural Environments	-	29.9	0.1
Intensive Uses	-	449.8	2.1
	Intensive animal production	22.7	0.1
	Mining	63.4	0.3
	Residential and farm infrastructure	333.3	1.6
Production from Dryland Agriculture and Plantations	Cropping	976.3	4.6
	Grazing modified pastures	565.5	2.7
	Plantation forests	9.5	<0.1
Production from Irrigated Agriculture and Plantations	Grazing irrigated modified pastures	29.4	0.1
	Irrigated cropping	947.3	4.5
Production from Relatively Natural Environments	Grazing native vegetation	16,909.9	80.5
Water	Marsh/wetland	127.6	0.6
	Reservoirs/dam	356.4	1.7
	River	181.3	0.9
	Total	**21,002.4**	-

6.1.4 Habitat Connectivity and Fauna Movement

The QLD State government has developed Biodiversity Planning Assessments (BPAs) to identify terrestrial ecological values of conservation significance including biodiversity movement corridors. BPAs use existing data to assess ecological concepts such as rarity, diversity, fragmentation, habitat condition, resilience, threats, and ecosystem processes in a uniform and reliable manner across a bioregion. Movement corridors and areas with special biodiversity value (e.g. centres of endemism or wildlife refugia) are informed by expert knowledge. The overall biodiversity significance is derived for each spatial unit based upon combinations of these values. Whilst MNES values are not considered explicitly in this mapping, many of the listed species and communities under the EPBC Act are also protected under QLD legislation.

6.1.4.1 Biodiversity Corridors

Historic (broad scale land clearing) and current land use practices (agricultural, mining and coal seam gas) have diminished the habitat connectivity value of most of the Project Area, both at the local and landscape scale. No Statewide terrestrial biodiversity corridors are mapped within the Project Area, with the closest located to the west in association with the remnant vegetation of the Dawson Range. Landscape connectivity, particularly within the Project Area, is largely limited to narrow tracts of roadside vegetation and riparian corridors.

Of particular importance is the Dawson River and the associated riparian and floodplain vegetation communities, which was largely untouched during the agricultural development of the region and is mapped in the BPA as a Statewide riparian biodiversity corridor (**Figure 6.2**). The myrtaceous canopy vegetation supported is intact and mature, including along the river despite banks being steep and/or eroded in places. The average width of the Dawson River riparian zone is 250 m (125 m either side of the river). In many locations however, the total corridor width inclusive of flanking floodplain communities is substantially wider, including greater than 1 km in the southern Project Area where the river bends. Across the eastern Project Area, most of the narrow linear areas of habitat associated with drainage lines that have persisted within the agricultural landscape exhibit some degree of connectivity to the Dawson River. West of the southern Project Area, the river also meanders towards the Dawson Range, potentially providing a point of connection at the Highworth Bend Conservation Park to the identified terrestrial corridor that is otherwise isolated by cleared agricultural land.

Although the Dawson River riparian zone has been subject to indirect impacts resultant from land-use changes and clearing in areas immediately adjacent, the nature and size of the corridor has allowed for the severity of edge effects and other anthropogenic disturbance to be minimised. This riparian corridor and the permanent waterbody it contains provides high quality, resilient habitat that affords movement opportunities for a wide range of fauna species, as well as sheltered access to permanent water and other habitat features limited in the landscape such as large hollow-bearing trees.

Kianga Creek in the north and Huon Creek in the central-south Project Area are also mapped in the BPA as Regional riparian biodiversity corridors. Both of these watercourses are narrow and ephemeral (see **Section 6.1.5**) and as a result have been subject to a greater degree of modification than the Dawson River, including exposure to cattle grazing and vegetation clearing to facilitate crossings and fence lines. Kianga Creek supports a riparian corridor of disjunct linear patches that vary in width (30–150 m) and frequently comprise brigalow-dominated vegetation. The patches are mostly separated by gaps 100 m wide or less. Whilst some fauna movement opportunities are provided, the Kianga Creek habitat corridor is likely to support a lower diversity of fauna species and be unsuitable for habitat specialists as a result of the changing vegetation composition (brigalow communities for example are not known to support threatened arboreal mammals), fragmentation and often highly disturbed riparian zone/areas of severe edge effects. Huon Creek has been largely cleared, with intact areas of vegetation only supported where the creek line nears the Dawson River.

6.1.4.2 Other Areas of Biodiversity Significance

Despite being dominated by non-remnant historically cleared land, the Project Area does support approximately 2,502 ha of vegetation and habitat that is considered to have State, Regional or, to a lesser extent, Local biodiversity significance (**Figure 6.2**). State significant areas are most common, covering approximately 1,067 ha or 5% of the Project Area, and occur primarily within the Dawson River corridor and along Theodore Moura Road. Regionally significant areas cover a similar extent (approximately 1,000 ha) and are concentrated to the central and northern Project Area, including either side of the Dawson Highway and Theodore Moura Road, parts of Kianga Creek and the unnamed drainage lines south of Moura. All identified areas of biodiversity significance coincide with areas captured in the State RE map as remnant or high-value regrowth (HVR) vegetation and are generally the largest patches of vegetation present within the Project Area.

These areas of significance often occur in proximity to each other, or the Dawson River, generally forming narrow habitat tracts with several small breaks. Greater levels of connectivity are observed in areas associated with the aforementioned riparian zones. However, the majority of patches outside of the Dawson River corridor are significantly isolated at the landscape scale and the expanse of non-remnant, highly modified habitat between patches likely acts as a barrier to movement for many fauna species.

It is noted that many patches captured in the Project's refined vegetation and habitat map are not included in the State RE mapping, either due to patch size/shape (too small or too narrow in width for adopted scale) and/or vegetation age (cleared within the last 15 years). These added areas are likely to have low habitat functionality, with patch viability highly compromised by edge effects and other disturbances. Nonetheless, these habitat fragments may facilitate access and provide 'stepping-stone' opportunities to State-mapped significant areas for a range of highly mobile species including some listed threatened and migratory species, who are able to traverse non-remnant landscapes (i.e. squatter pigeon (southern) and koala).

Although typically in non-remnant condition and therefore not captured in the BPAs, gilgai formations occur extensively throughout the Project Area. These areas provide a seasonal resource for waterbirds when inundated. Local movement opportunities within these gilgai formations are also present for small ground-dwelling fauna, including the frogs and snakes that regularly inhabit them.

A Nature Refuge (Willawa Nature Refuge) is located adjacent to the south-east corner of the Project Area (**Figure 6.2**). A review of the Wetland*Info* identifies the area primarily as riverine wetland, with 93 fauna species previously identified, including koala and greater glider (noting that these statistics are based on a 10 km^2 grid and hence species observations are not necessarily from within the Nature Refuge, but could be associated with the surrounding area instead). A review of the aerial imagery reveals the Nature Refuge to primarily comprise of gilgai formations and riparian woodlands. As previously mentioned, both of these habitat types provide a suitable dispersal matrix for a number of species, the gilgai for frogs, snakes and waterbirds and the riparian vegetation for a broad suite of aquatic and terrestrial taxa.

6.1.4.3 Barriers

For ground-dwelling fauna and particularly larger-bodied mammals, a variety of physical barriers or impediments to movement are present within the Project Area, reflecting its brownfield nature (**Figure 6.3**). Areas of intensive use and cropping are considered high-risk for traversing fauna, given frequent activity and the nature of the works requiring ongoing and regular disturbance to the ground layer. Many areas within the Project Area are also fenced, primarily by barbed wire fences or, in some places, exclusion fencing. Barbed wire fences are a known threat to arboreal mammals including the greater glider (southern and central) and the yellow-bellied glider (south-eastern) due to entanglement risks while gliding.

Several roads and tracks also dissect the Project Area in all directions. This includes major connecting roads such as the Dawson Highway (largely east – west) and Theodore-Moura Road (largely north – south) as well as the Moura Rail easement located adjacent and parallel to the Theodore-Moura Road. Although habitat on either side of the road may retain functional connectivity for species with high dispersal capacity, the road and the habitat gap in which it occurs are likely to present significant barriers to movement for numerous taxa. Movement across these roads in particular presents an elevated risk of death or injury by vehicle collision in contrast to the numerous tracks and dirt roads which are less frequently used.

Barriers to landscape scale movement also exist; the most significant being the Dawson Mine which runs parallel with the entire eastern extent of the Project Area (**Figure 6.3**). The location and scale of this barrier would severely restrict west to east movement of all species present within the Project Area, with the exception of highly mobile bird and bat species. It is also noted that several weirs are present along the Dawson River, including the Moura weir to the north and the Dawson River weir to the south of the Project Area. These weirs have modified the natural flow regime and are likely to be a barrier to movement for some taxa, particularly aquatic taxa (described further in **Section 6.1.6** below).

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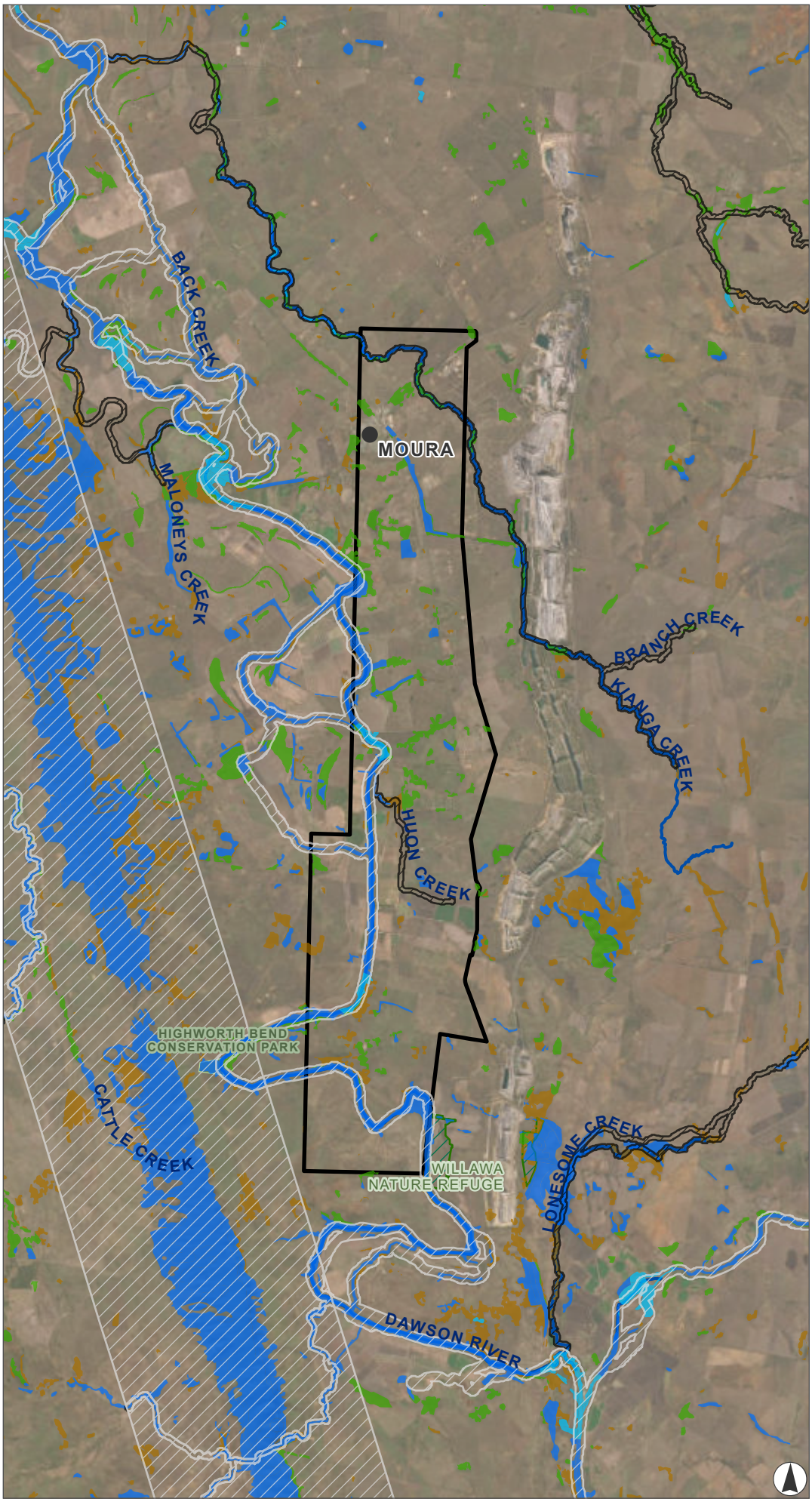

FIGURE 6.2

Biodiversity Planning Assessment Mapping

Legend

- Major Watercourse
- Project Area
- Cadastre
- Nature Refuge
- Protected Areas

Statewide Biodiversity Corridors

- State
- Regional

Biodiversity Planning Assessment - Brigalow Belt

- State Habitat for EVNT taxa
- State
- Regional
- Local or Other Values



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Kilometres

Scale 1:250,000 at A4
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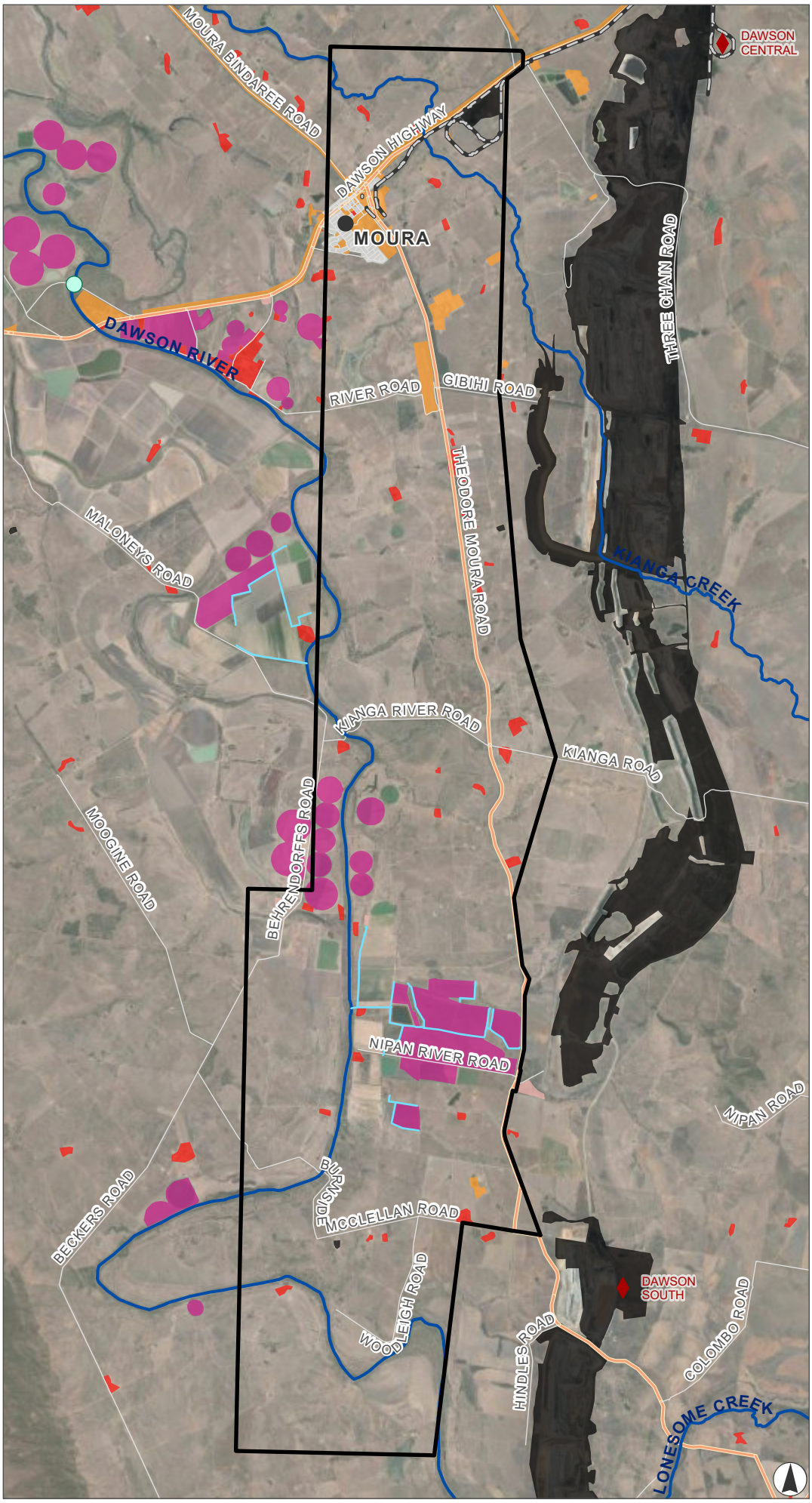

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umwelt

FIGURE 6.3

Potential Fauna Movement Barriers

Legend

- Weir
- Coal mine
- Major Watercourse
- Canal line
- Highway (Arterial Road) / Connector (Collector Road)
- Local
- Railway
- Project Area
- Cadastre

Land Use

- Irrigated cropping
- Intensive uses
- Intensive animal production
- Horse studs
- Residential and farm infrastructure
- Urban residential
- Mining



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6.1.5 Groundwater Dependent Ecosystems

The Project is located within the Dawson River catchment; a sub-basin of the Fitzroy Basin. Groundwater systems within the Project Area include: Quaternary deposits comprising alluvium associated with the Dawson River; Cenozoic sediments; Triassic Moolayember Formation, Clematis Group and Rewan Group; and Permian coal measures. Jurassic units of the Surat Basin, comprising the Boxvale Sandstone Member, Evergreen Formation and Precipice Sandstone, are located to the south of the Project Area (KCB Australia, 2021). Within the Project Area, groundwater is predominantly used for stock and domestic purposes, with the majority of third-party bores (within a 25 km radius) screened within the Quaternary alluvium and the undivided Permian basement (KCB Australia, 2021).

The distribution of known and potential groundwater dependent ecosystems (GDEs) and aquifers has been mapped across QLD (Department of Environment and Science, 2018) including the Project Area. GDEs are ecosystems that are dependent on the discharge of groundwater on a permanent or intermittent basis to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services. The three categories of GDE are: aquifer and cave systems; ecosystems dependent on the surface expression of groundwater (surface-expression GDEs); and ecosystems dependent on the subsurface presence of groundwater (terrestrial GDEs) (Eamus et al. 2006b).

As per the Department of Environment and Science (2018) mapping, approximately half of the Project Area supports a shallow, unconsolidated sedimentary aquifer system, described as "*Quaternary alluvial aquifers with fluctuating, intermittent groundwater connectivity regime with neutral pH*" (**Figure 6.4**).

The Project Area does not support any surface or subterranean GDEs, nor do any occur immediately adjacent. Low-confidence, potential terrestrial GDEs are mapped to occur within the Dawson River corridor and at scattered, small and discrete patches located on the floodplains east and west of the river (**Figure 6.4**). These GDEs are categorised as "*Treed regional ecosystems on alluvia with fluctuating, intermittent flow and neutral pH in the central and western Dawson River catchment*" (Department of Environment and Science, 2018). Mapped terrestrial GDEs are all derived from satellite imagery or State RE mapping, rather than assigned based on known groundwater dependence. As described by KCB Australia in the Project's Groundwater Assessment (2021), potential terrestrial GDEs present within the Project Area, if groundwater dependant (or at least in part), would likely be sourcing groundwater from the alluvium associated with the Dawson River and key tributaries.

As described in the *Technical summary: terrestrial groundwater-dependent ecosystems in the Surat Cumulative Management Area* (Department of Natural Resources, Mines and Energy, 2019), groundwater use by Australian flora varies spatially and temporally, within and between species. Reliability of water sources is important; a tree may preferentially access saline groundwater rather than adjacent water from an intermittent stream (Mensforth et al. 1994). The ability for a plant to access groundwater is conferred by the root architecture and rooting depth. Vegetation communities that are solely reliant on shallow soil moisture are not terrestrial GDEs.

All eucalypts could be considered deep-rooted due to their capacity for a dimorphic root architecture. In contrast, brigalow is a clonal species with stems arising from shallow horizontal roots (Thorburn, Cowie & Lawrence 1991, Johnson et al. 2016) and could be considered predominantly shallow-rooted. Based on the above, it is considered possible that areas of eucalypt-dominated woodland and forest on alluvial (i.e. land zone 3) within the Project Area that occur in proximity to the Dawson River access groundwater and may be partially groundwater dependent. These communities may comprise MNES including listed threatened ecological communities and habitat for listed fauna species, as described in **Section 6.4**, **Section 9.2** and **Section 9.3**.

6.1.6 Wetlands and Watercourses

Several watercourses of varying capacity and ephemerality intersect the Project Area (**Figure 6.5**).

The perennial Dawson River (stream order 8) is a dominant landscape features that meanders along the western edge of the lease, flowing from south to north. The Dawson River and associated creeks and tributaries including Kianga Creek (stream order 4) and Huon Creek (stream order 2) may provide suitable aquatic habitat for a range of species including fish, turtles, crustaceans and aquatic mammals, particularly where supported by woody riparian vegetation. As described in **Section 6.1.4**, the riparian and floodplain vegetation associated with the Dawson River, in particular, is intact with low-levels of disturbance relative to the other watercourses, supporting a range of habitat features such as large hollows, a dense understorey and a variety of macrophytes. Watercourses within the Project Area are mapped under the VM Act, which includes provisions for the protection of riparian vegetation associated with the watercourses.

It should be noted that two weirs occur along the Dawson River immediately north-west of the Project Area (the Moura weir, completed in 1946) and immediately south of the Project Area (the Dawson River Weir, completed in 1930). Following installation, these features likely resulted in significantly altered and/or reduced surface water flows within the river and its tributaries throughout the Project Area. However, refurbishments of the Moura weir were completed in 1999 and at this time a vertical slot fishway was installed to facilitate aquatic fauna movement. The fishway has a 7.0 m operating head and is 142 m long, which makes it the highest and largest vertical-slot fish passage facility in Australia. The fishway is designed to operate over a headwater variation of 2.4 m and a tailwater variation of 2.9 m requiring four upstream and three downstream control gates. The fishway is only used when water releases are required. It is unclear if the Dawson River weir has a fishway or fish ladder installed.

The PMST identifies no Wetlands of International Importance within the search area (10 km radius of the Project Area). No wetlands of High Ecological Significance were identified during the assessment, however, two are located to the west of the Project Area. As represented in the DESI Wetland areas mapping, the Project Area contains several waterbodies that are considered palustrine and lacustrine wetlands, with the majority being hydrologically modified or artificial (i.e. farm dams) (**Figure 6.5**). Wetland areas associated with hydrologically natural regimes are primarily limited to the Dawson River and adjacent floodplain, Kianga Creek and larger patches of State-mapped vegetation that intersect drainage lines. Wetland values within the Project Area vary however the majority are of low conservation value.

One large, artificial lacustrine wetland occurs within the northern portion of the Project Area, which is the offstream storage associated with the Moura weir. Compared to the other dams within the Project Area, this waterbody offers high quality fauna habitat as it supports fringing canopy vegetation along most of its boundary, common stags within the water and aquatic vegetation. The highly modified nature of the remainder of the waterbodies within the Project Area likely reduces their habitat value for native fauna, particularly during the wet season when water is abundant in the landscape.

Palustrine and lacustrine wetlands including dams and marshes may also provide suitable habitat for wetland indicator species which are described as species which rely on a water resource for some or all stages of their lifecycle (Department of Environment and Science, 2019a).

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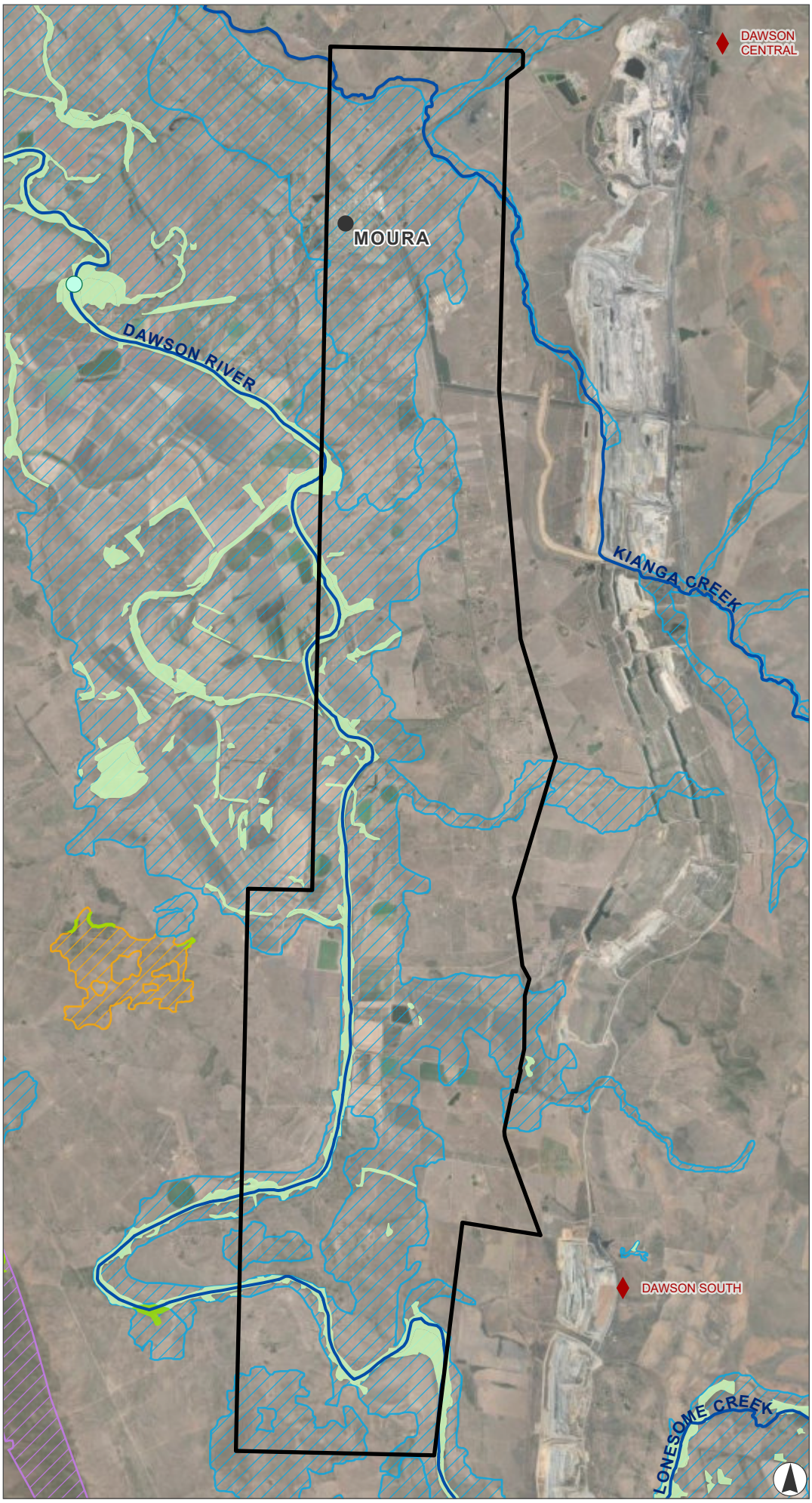

FIGURE 6.4

Groundwater dependent ecosystems and aquifers

Legend

- Weir
- Coal mine
- Major Watercourse
- Project Area
- Cadastre

Potential GDE aquifers

- Unconsolidated sedimentary aquifers
- Consolidated sedimentary aquifers
- Igneous rock aquifers
- No identified aquifers

Terrestrial GDE areas

- 81-100% Derived GDE - moderate confidence
- 81-100% Derived GDE - low confidence
- 01-80% Derived GDE - moderate confidence



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Kilometres

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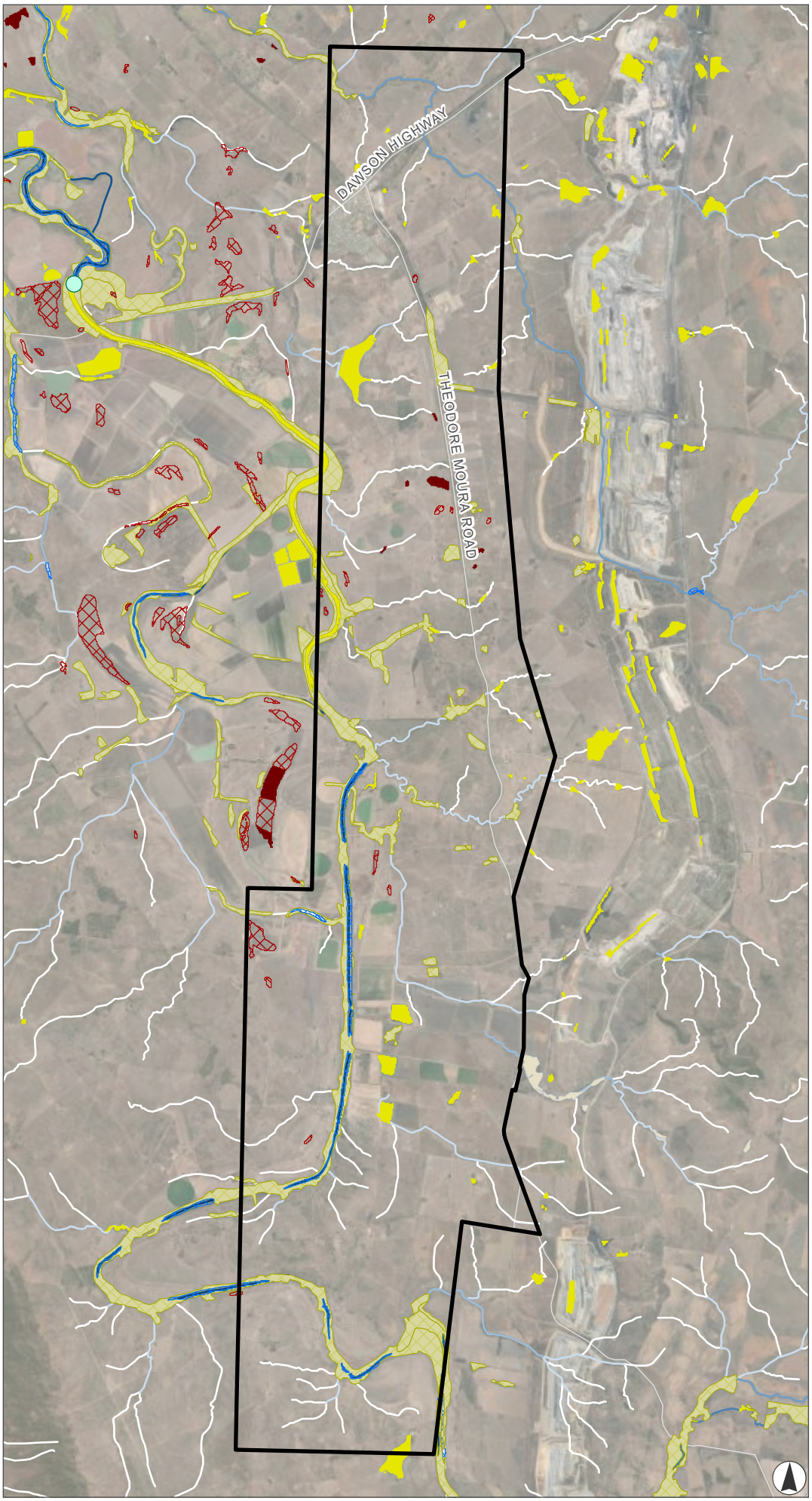

FIGURE 6.5

Wetlands and Watercourses

Legend

- Weir
- Roads
- Project Area

Vegetation Management Watercourse

- 1
- 2
- 3
- 4
- 5
- 7
- 8

Wetland areas

- Palustrine wetlands [hydrologically natural]
- Riverine wetlands [hydrologically natural]
- Lacustrine wetlands [hydrologically modified or artificial]
- Palustrine wetlands [hydrologically modified or artificial]
- Sub-dominant wetlands [51 to 80%]
- Contains wetlands [1 to 50%]



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6.2 Previous Ecological Study Results

6.2.1 Project Area

The review of previous ecological studies (**Section 4.1.2.2**) identified the potential and confirmed presence of MNES in the Project Area (**Table 6.2**). Surveys which did not encounter potential MNES are excluded from the table. Specifics of each MNES have been incorporated into to the relevant sections below.

Table 6.2 Previous Ecological Studies within Project Area and Associated MNES Results

Survey Timing	Surveyor	MNES Result
September 2019	Umwelt	Brigalow TEC and Coolibah TEC confirmed. Two EPBC Act listed flora species identified: *Solanum dissectum* (Endangered) and *Xerothamnella herbacea* (Endangered).
October 2019	Umwelt	No TEC identified. Analogous REs to Brigalow TEC confirmed, however areas did not meet TEC status.
November 2019	Umwelt	Brigalow TEC confirmed. One listed flora species identified: *Solanum johnsonianum* (Endangered).
December 2019	Eco Logical Australia	Brigalow TEC confirmed. One listed flora species identified: *Solanum johnsonianum* (Endangered).
March 2020	Eco Logical Australia	No TEC identified. Analogous REs to Brigalow TEC and Poplar Box TEC confirmed, however areas did not meet TEC status.
March 2020	Umwelt	Ornamental snake (*Denisonia maculata*; Vulnerable) observed.
March 2021	Umwelt	Brigalow TEC confirmed.
July 2022	Eco Logical Australia	No TEC identified. Analogous REs to Brigalow TEC confirmed, however areas did not meet TEC status.
August 2022	Eco Logical Australia	No TEC identified. Analogous REs to Brigalow TEC and Poplar Box TEC confirmed, however areas did not meet TEC status.
June 2023	Umwelt	Brigalow TEC confirmed. One listed flora species identified: *Solanum johnsonianum* (Endangered).
April 2024	Umwelt	

6.2.2 Wider Region

Several MNES have been recorded in the wider region as part of previous ecological studies completed over the past decade for other proposed projects (**Table 6.3**).

Table 6.3 Projects in Wider Region and Associated MNES Results

Project	Survey Timing	MNES Result
Moura Solar Fam (Referral 2021/8973)	October 2017	Brigalow TEC confirmed.
Theodore Wind Farm (Referral Number 2024/09842)	October 2022, February, March, June, September/October and December 2023, February 2024	Poplar Box TEC confirmed. Squatter pigeon (southern) (*Geophaps scripta scripta*) and greater glider (southern and central) (*Petauroides volans*) (both Vulnerable at the time) observed during the field survey program.
Banana Range Wind Farm (Referral Number 2019/8503)	May and November 2018	Semi-evergreen vine thickets of Brigalow Belt (North and South) and Nandewar Bioregions TEC (SEVT TEC) confirmed. Greater glider (southern and central) (*Petauroides volans*) (Vulnerable) and white-throated needletail (*Hirundapus caudacutus*) (Vulnerable and Migratory) observed during the field survey program.
Dawson West Mining Project (Referral Number 2018/8269)	2017–2018	Brigalow TEC and SEVT TEC confirmed. Squatter pigeon (southern) (*Geophaps scripta scripta*) and greater glider (southern and central) (*Petauroides volans*) (both Vulnerable at the time) observed during the field survey program.

6.3 Vegetation Communities

The State RE mapping shows approximately 95% of the Project Area to be non-remnant vegetation. Ground-truthing of the Project Area confirmed this to be largely true (approximately 90% of the Project Area), however additional vegetated patches, generally comprising woodlands or low woodlands were also identified, particularly in the northern extent. Patches that were field validated but not identified in the State mapping were usually small and/or comprised regrowth. The configuration and composition of mapped remnant and high-value regrowth vegetation patches were refined to reflect on ground values. This was particularly necessary where vegetation was associated with watercourse or drainage line, as actual vegetation boundaries were generally narrower and more disconnected.

Vegetation within the Project Area includes remnant (735.6 ha) and regrowth (640.7 ha) woodland and forest communities as well as non-remnant areas (19,625.8 ha) consisting of pasture, cropping, mining and surface infrastructure. Brigalow woodland is present across the entire Project Area, occurring as discontinuous patches, largely upon gently undulating, cracking clay soils, but also as a fringing woodland along waterways. These woodlands are generally characterised by a closed canopy of brigalow and the presence of species such as belah (*Casuarina cristata*), wilga (*Geijera parviflora*), false sandalwood (*Eremophila mitchellii*) and currant bush (*Carissa ovata*). Gilgai formations are often a common feature in the brigalow woodlands.

Riparian woodlands dominated by forest red gum (*Eucalyptus tereticornis*) or river red gum (*Eucalyptus camaldulensis*) and coolibah (*Eucalyptus coolabah*) are situated along major waterways and some drainage lines within the Project Area. These woodlands typically comprise an open shrub layer and conspicuous grassy layer of species such as green panic grass (*Megathyrsus maximus**) and sabi grass (*Urochloa mosambicensis**). Tree species present in these woodlands can include river oak (*Casuarina cunninghamiana*) and river tea-tree (*Melaleuca bracteata*).

Twenty-one RE types have been identified as occurring within the Project Area. A full list of REs, as defined under the VM Act, that occur the Project Area is provided in **Table 6.4** and displayed on **Figure 6.6,** with refined vegetation mapping based on field surveys displayed on **Figure 6.7**. Composition of vegetation and microhabitat features that occur within each of these REs and how they related to MNES are provided in the habitat type descriptions in **Section 6.4**.

Table 6.4 REs[1] within the Project Area

RE ID	Short Description	VM Act Status	Analogous TEC
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains.	Endangered	Brigalow TEC
11.3.2	*Eucalyptus populnea* woodland on alluvial plains.	Of concern	Poplar Box TEC Components can form Myall TEC
11.3.3	*Eucalyptus coolabah* woodland on alluvial plains.	Of concern	Coolibah TEC
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains.	Of concern	-
11.3.6	*Eucalyptus melanophloia* woodland on alluvial plains.	Least concern	-
11.3.17	*Eucalyptus populnea* woodland with *Acacia harpophylla* and/or *Casuarina cristata* on alluvial plains.	Of concern	Poplar Box TEC
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	Least concern	-
11.3.27f	*Eucalyptus coolabah* and/or *E. tereticornis* open woodland to woodland fringing swamps.	Least concern	-
11.4.3	*Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains.	Endangered	Brigalow TEC
11.4.7	*Eucalyptus populnea* with *Acacia harpophylla* and/or *Casuarina cristata* open forest to woodland on Cainozoic clay plains.	Endangered	Poplar Box TEC Brigalow TEC
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains.	Endangered	Brigalow TEC
11.4.9	*Acacia harpophylla* shrubby woodland with Terminalia oblongata on Cainozoic clay plains	Endangered	Brigalow TEC
11.4.9a	*Acacia harpophylla*, *Lysiphyllum carronii* +/- *Casuarina cristata* open forest to woodland.	Endangered	Brigalow TEC
11.4.12	*Eucalyptus populnea* woodland on Cainozoic clay plains	Endangered	Poplar Box TEC
11.5.2	*Eucalyptus crebra*, *Corymbia* spp., with *E. moluccana* woodland on lower slopes of Cainozoic sand plains and/or remnant surfaces.	Least concern	-
11.5.2a	*Allocasuarina luehmannii* low tree layer with or without emergent woodland. Occurs on Cainozoic sandplains which are often below hills and ranges	Least concern	-
11.9.1	*Acacia harpophylla-Eucalyptus cambageana* woodland to open forest on fine-grained sedimentary rocks.	Endangered	Brigalow TEC

RE ID	Short Description	VM Act Status	Analogous TEC
11.9.2	*Eucalyptus melanophloia* +/- *E. orgadophila* woodland on fine-grained sedimentary rocks.	Least concern	-
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks.	Endangered	Brigalow TEC
11.9.7	*Eucalyptus populnea*, *Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks.	Of concern	-
11.9.10	*Eucalyptus populnea* open forest with a secondary tree layer of *Acacia harpophylla* and sometimes *Casuarina cristata* on fine-grained sedimentary rocks.	Of concern	-

[1] *All REs have been ground-truthed in at least one location within the Project Area, with the exception of RE 11.5.2a, 11.5.2 and 11.9.1. Refer to* ***Section 4.4.2*** *for further information.*

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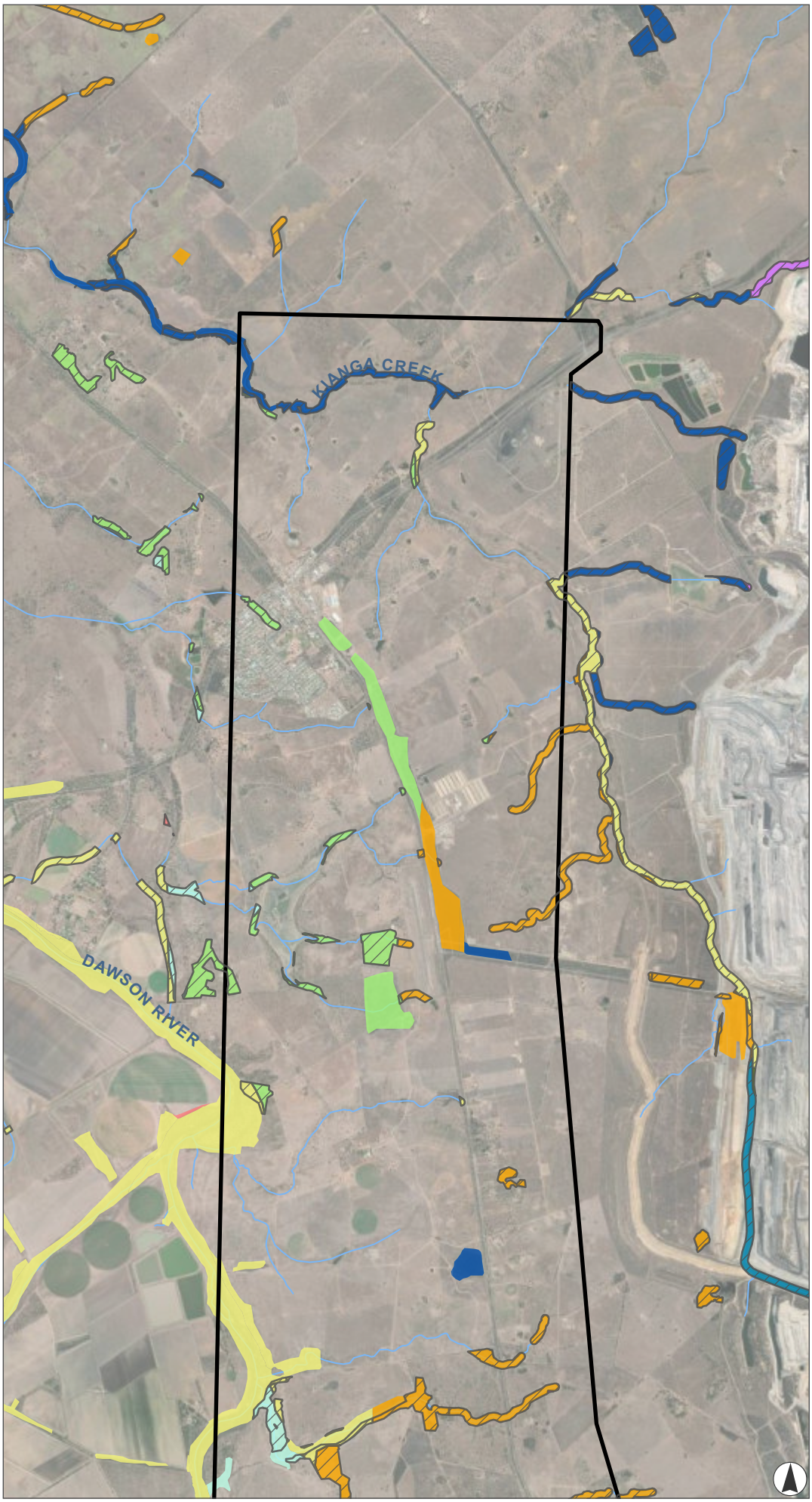


FIGURE 6.6A

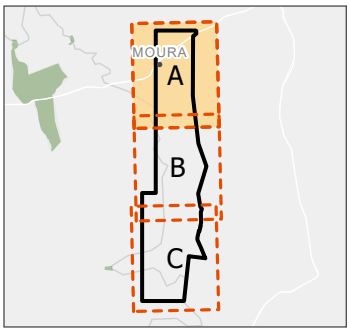
State Regional Ecosystem Mapping

Legend

- Watercourse
- Project Area

DoR Mapped Dominant Regional Ecosystem (Version 13)

- 11.3.1
- 11.3.2
- 11.3.3
- 11.4.8
- 11.4.9a
- 11.5.2a
- 11.9.1
- 11.9.2
- 11.9.4a
- 11.9.7
- non-rem
- High Value Regrowth



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Kilometres

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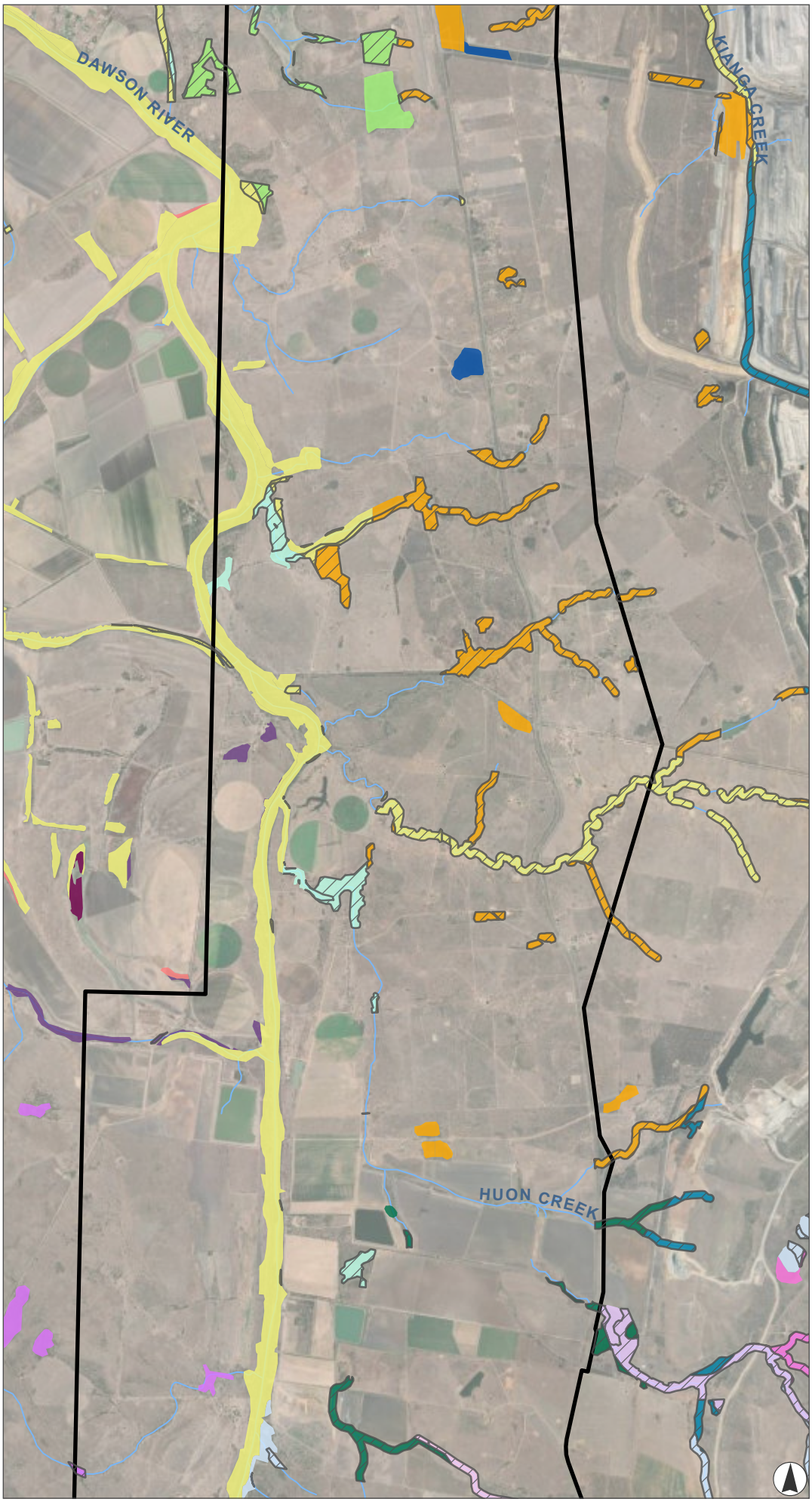


FIGURE 6.6B

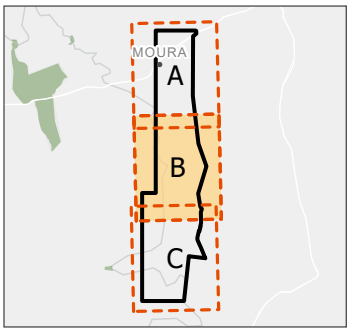
State Regional Ecosystem Mapping

Legend

- Watercourse
- Project Area

DoR Mapped Dominant Regional Ecosystem (Version 13)

- 11.3.1
- 11.3.11
- 11.3.17
- 11.3.2
- 11.3.25
- 11.3.3
- 11.3.6
- 11.4.8
- 11.4.9a
- 11.5.2a
- 11.9.1
- 11.9.2
- 11.9.3
- 11.9.4a
- 11.9.5
- 11.9.7
- non-rem
- High Value Regrowth



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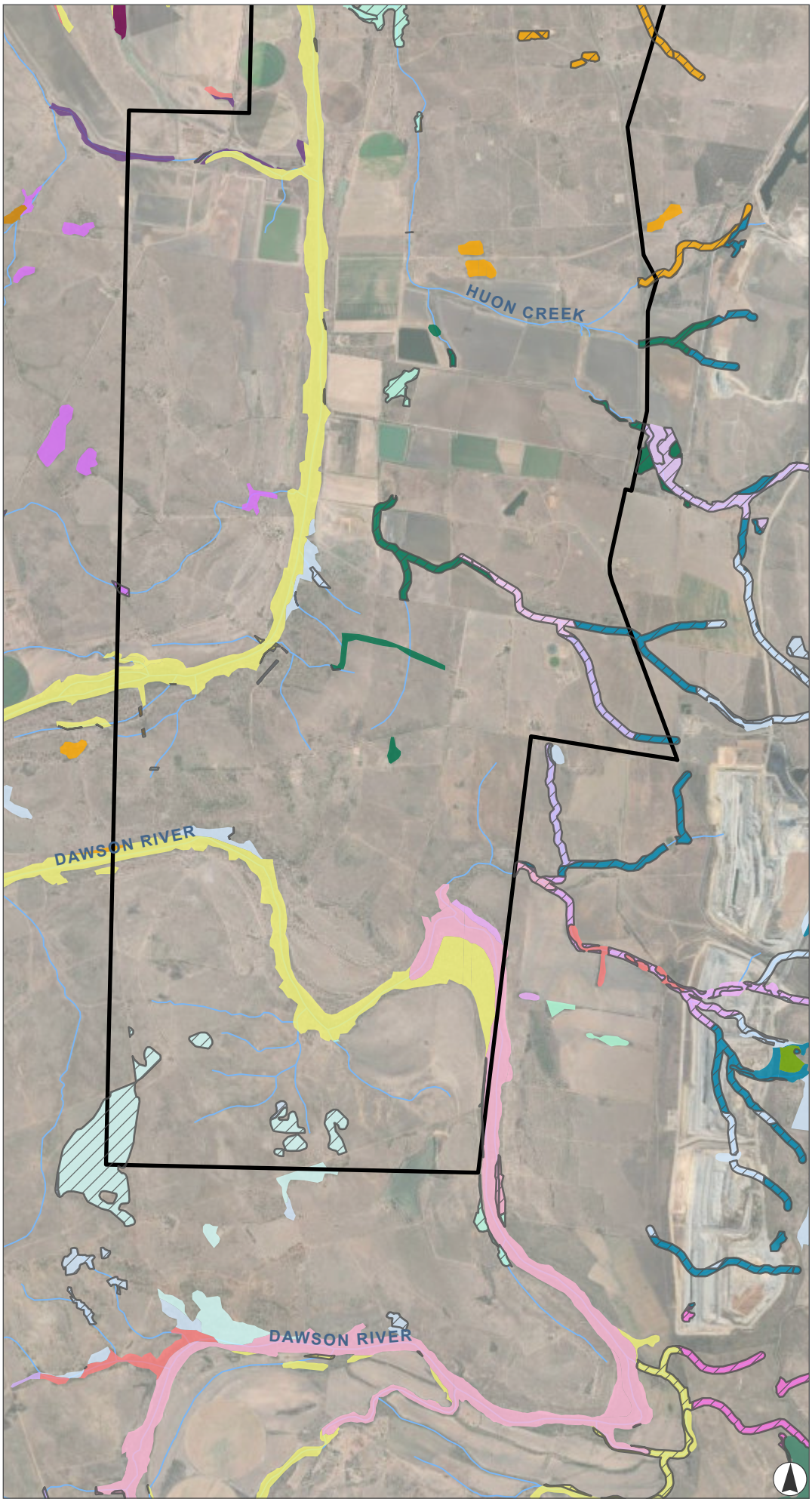


FIGURE 6.6C

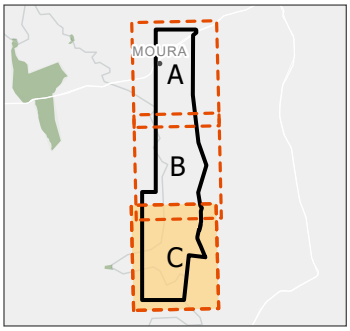
State Regional Ecosystem Mapping

Legend

- Watercourse
- Project Area

DoR Mapped Dominant Regional Ecosystem (Version 13)

- 11.3.1
- 11.3.11
- 11.3.17
- 11.3.2
- 11.3.25
- 11.3.3
- 11.3.4
- 11.3.6
- 11.4.3
- 11.4.7
- 11.4.9a
- 11.5.2
- 11.8.4
- 11.9.1
- 11.9.12
- 11.9.2
- 11.9.3
- 11.9.4a
- 11.9.5
- 11.9.5a
- 11.9.7
- 11.9.9
- non-rem
- High Value Regrowth



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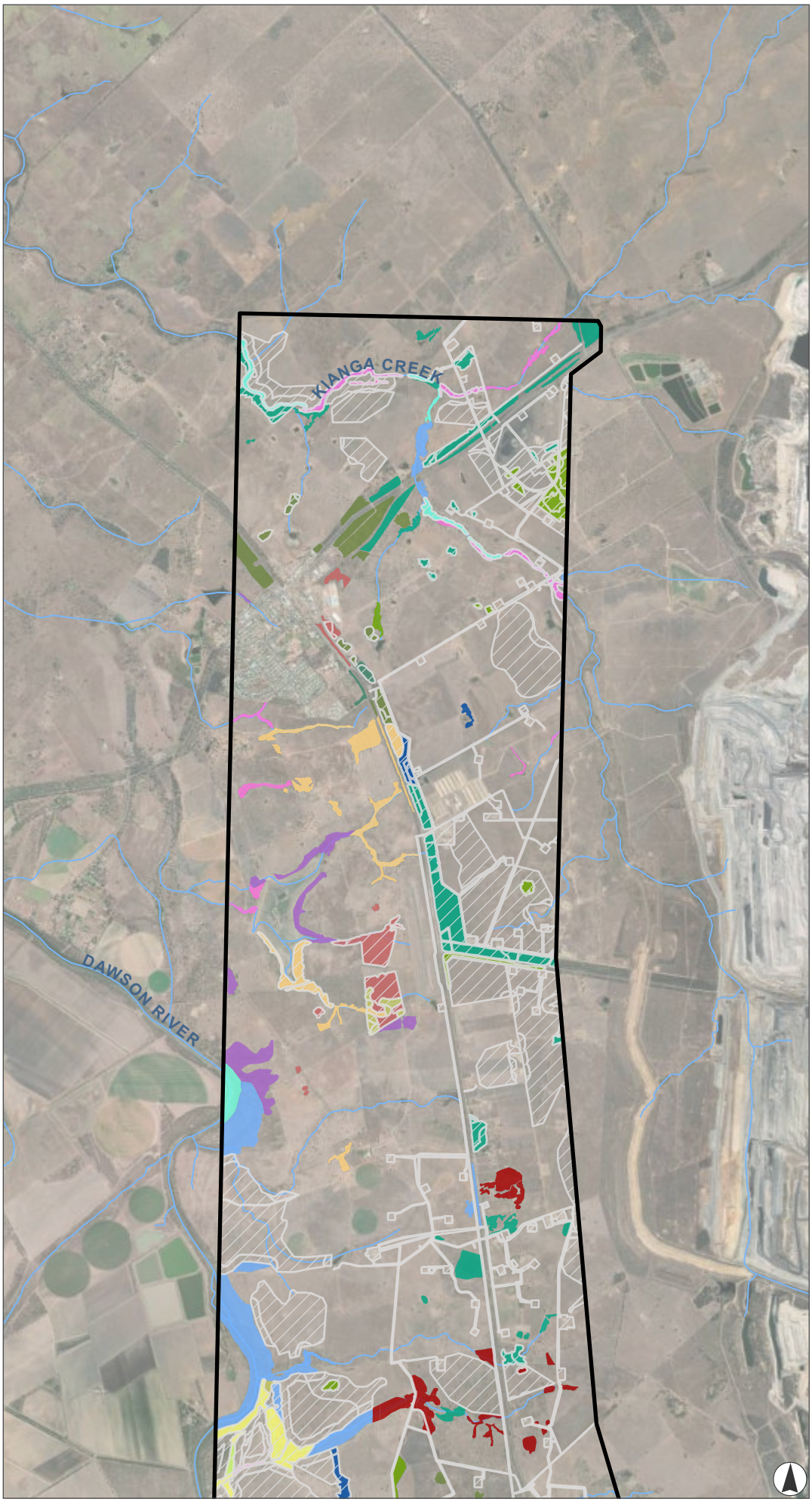


FIGURE 6.7A

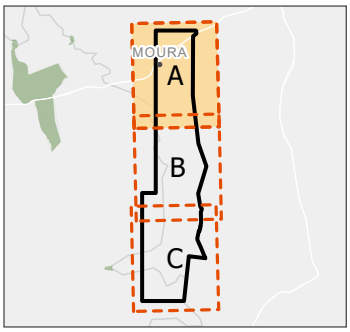
Refined Vegetation Mapping

Legend

- Watercourse
- Project Area
- Field Validated Vegetation Mapping

Refined Vegetation Mapping

- 11.3.1
- 11.3.2
- 11.3.25
- 11.3.27f
- 11.3.3
- 11.3.4
- 11.4.7
- 11.4.8
- 11.4.9
- 11.4.9a
- 11.5.2a
- 11.9.10
- 11.9.2
- 11.9.5
- 11.9.7
- non-rem



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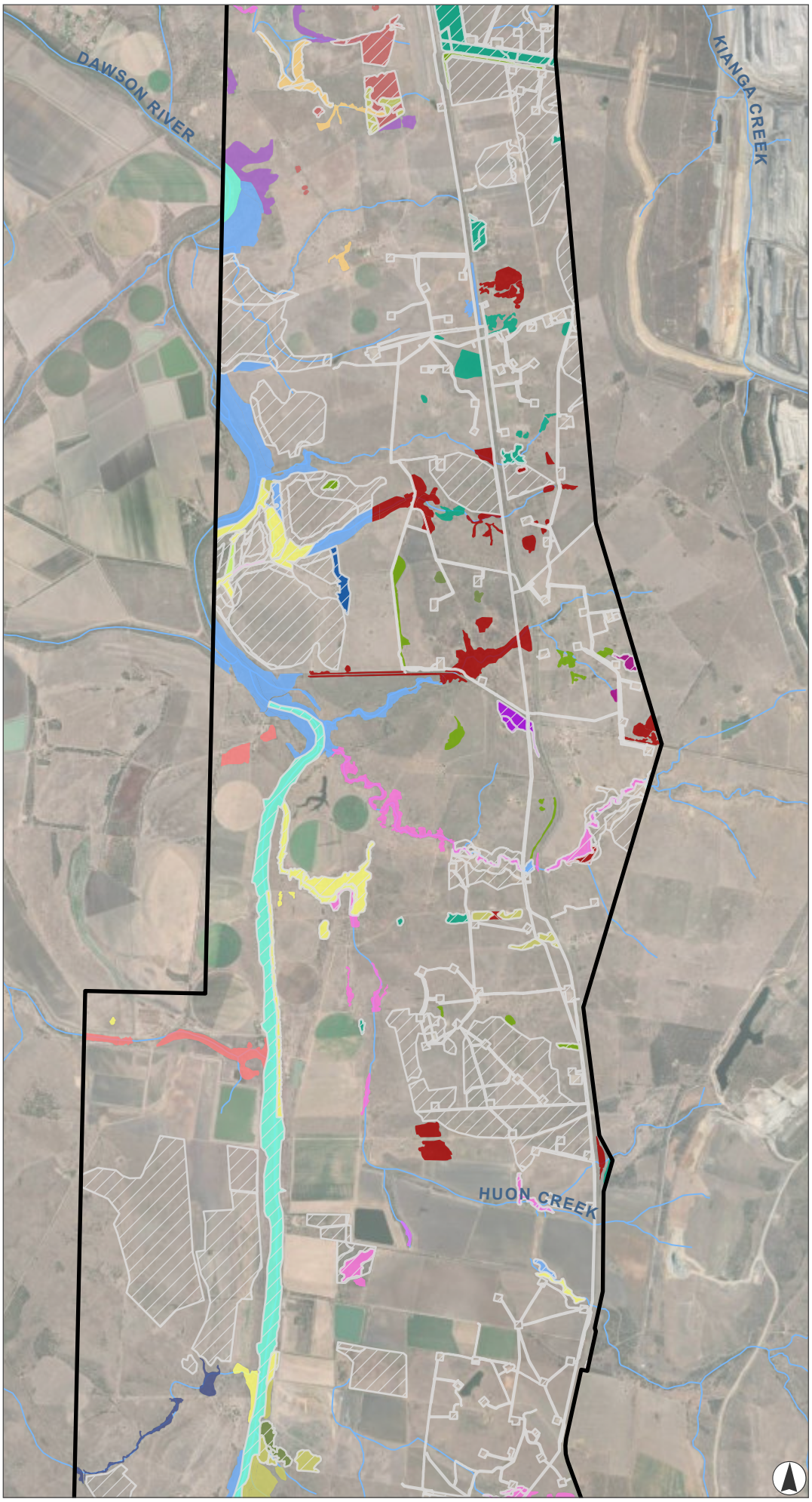


FIGURE 6.7B

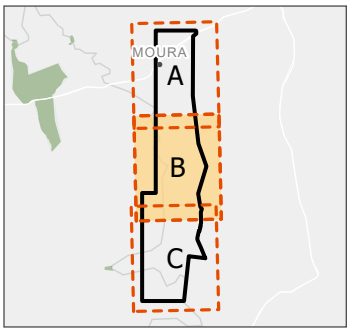
Refined Vegetation Mapping

Legend

- Watercourse
- Project Area
- Field Validated Vegetation Mapping

Refined Vegetation Mapping

- 11.3.1
- 11.3.17
- 11.3.2
- 11.3.25
- 11.3.27f
- 11.3.3
- 11.3.4
- 11.3.6
- 11.4.12
- 11.4.3
- 11.4.7
- 11.4.8
- 11.4.9
- 11.4.9a
- 11.5.2a
- 11.9.1
- 11.9.2
- 11.9.5
- 11.9.7
- non-rem



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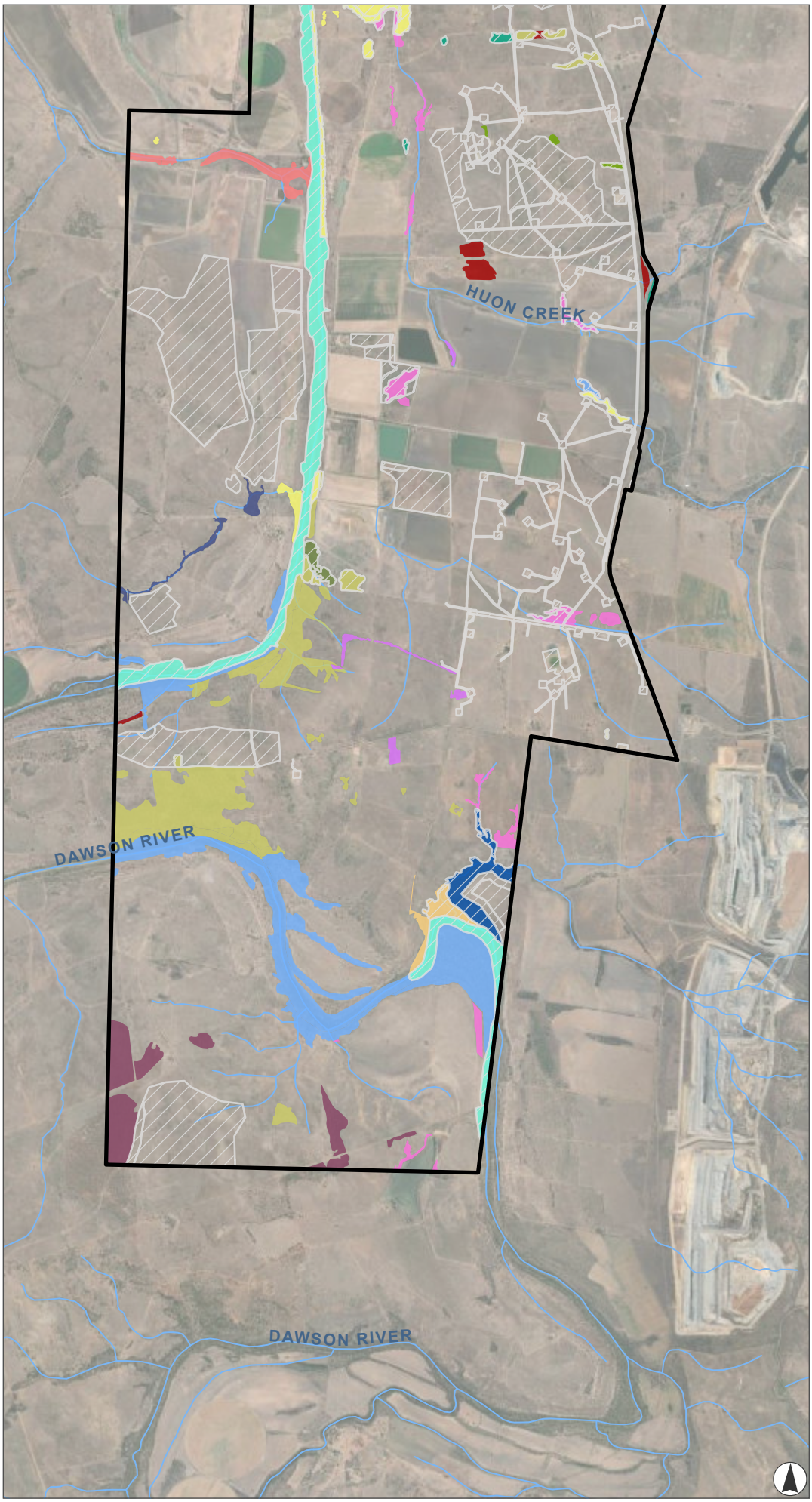


FIGURE 6.7C

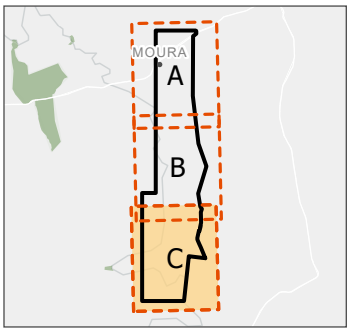
Refined Vegetation Mapping

Legend

- Watercourse
- Project Area
- Field Validated Vegetation Mapping

Refined Vegetation Mapping

- 11.3.1
- 11.3.17
- 11.3.2
- 11.3.25
- 11.3.3
- 11.3.4
- 11.3.6
- 11.4.7
- 11.4.8
- 11.4.9
- 11.4.9a
- 11.5.2
- 11.9.1
- 11.9.2
- 11.9.5
- non-rem



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6.3.1 Threatened Ecological Communities

Of the five TECs identified in the desktop assessment, two have been confirmed within the Project Area during the field survey program:

- Brigalow TEC
- Coolibah TEC.

The likelihood of occurrence assessment determined that an additional TEC (Poplar Box TEC) has a high likelihood of occurring, based on the presence of analogous REs within the Project Area as per the State and refined vegetation mapping (**Table 6.5**). The likelihood of occurrence is detailed in **Appendix B**.

Table 6.5 Threatened Ecological Communities Likelihood of Occurrence Outcomes (Known and High)

TEC	EPBC Act Status	Analogous RE in Project Area
Known		
Brigalow TEC	Endangered	11.3.1, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.9a, 11.9.1, 11.9.5
Coolibah TEC		11.3.3
High		
Poplar Box TEC	Endangered	11.3.2, 11.3.17, 11.4.7, 11.4.12

A conservative approach to the mapping of TECs has been employed to ensure the reassessment of TEC status is completed as appropriate. Specifically, patches that have been previously assessed in the field that failed to meet TEC status solely due to the exotic perennial vegetation cover condition criteria are still mapped as potential TEC. This has been done in consideration of the age of some the TEC assessments (>2 years old) and the fact that ground layer composition and cover can change over time in response to climatic conditions such as rainfall and on ground pressures such as grazing.

6.3.1.1 Brigalow TEC

A total of 988.8 ha of Brigalow TEC is mapped within the Project Area including 117.4 ha of confirmed and 871.4 ha of potential TEC. Brigalow TEC has been confirmed at 33 locations across the Project Area by Umwelt in 2019, 2023 and 2024. There are seven RE analogous with this TEC mapped within the Project Area, six of which have been ground-truthed during field surveys. One additional analogous RE (11.9.1) has not yet been subject to field verification however is identified as present as per the State RE mapping.

Patch sizes of confirmed Brigalow TEC vary from 0.6 ha to 26.7 ha. Remnant and regrowth vegetation consistent with this TEC is generally sparsely distributed throughout the Project Area, with patches generally small and isolated amongst cleared non-remnant paddocks. However, larger contiguous patches do exist, particularly along roadways such as Theodore Moura Road and in association with the major watercourse Kianga Creek.

The condition of this TEC varied across the Project Area, with large remnant patches limited in the landscape but generally of highest quality. Many regrowth brigalow patches exist throughout the Project Area that do not meet key condition thresholds to be considered the TEC.

Generally, these patches did not meet TEC status because total exotic cover exceeded native vegetative cover (all layers combined) and/or patch size was not more than 0.5 ha (Department of the Environment, 2013a). Non-compliant brigalow patches typically comprise open canopies and a dense ground layer of exotic pasture grasses.

In unsurveyed parts of the Project Area, vegetation containing an analogous RE with this TEC was conservatively mapped to contain the TEC. Mapped TEC within the Project Area also includes State mapped heterogenous polygons; although the full extent of these areas has been included, they may only partially contain an analogous RE, they may contain a different RE altogether, or the RE may be dominated by a different tree species and therefore the diagnostic criteria for the TEC may not be met.



Photo 6.1 Representative vegetation of Brigalow TEC

6.3.1.2 Coolibah TEC

A total of 105.1 ha of Coolibah TEC is mapped within the Project Area including 24.5 ha of confirmed TEC and 80.6 ha of potential TEC. Coolibah TEC has been confirmed at one broad area within the Project Area. Two discrete patches (9.77 ha and 14.75 ha) occur along or in proximity to the Dawson River on the associated floodplain within the central Project Area. These patches comprised *Eucalyptus coolabah* woodland to open woodland analogous to RE 11.3.3 – *E. coolabah* woodland on alluvial plains.
This community exhibited a high degree of disturbance on the floodplain, particularly from parthenium (*Parthenium hysterophorus**), a Weed of National Significance.

Three additional patches of vegetation analogous to Coolibah TEC (RE 11.3.3) have been assessed and found to not meet the condition criteria of the TEC as they were either below the minimum patch size threshold (<5 ha) (one patch), present as regrowth patches where tree canopy present did not contain mature or hollow-bearing trees of the minimum DBH threshold (≥30 cm) or had a ground layer dominated by exotic grass such as *Megathyrsus maximus*.*

In unsurveyed parts of the Project Area, vegetation containing an analogous RE with this TEC was conservatively mapped to contain the TEC. Mapped TEC within the Project Area also includes State mapped heterogenous polygons; although the full extent of these areas has been included, they may only partially contain an analogous RE, they may contain a different RE altogether, or the RE may be dominated by a different tree species and therefore the diagnostic criteria for the TEC may not be met.



Photo 6.2 Representative vegetation of Coolibah TEC

6.3.1.3 Poplar Box TEC

A total of 705.0 ha of potential Poplar Box TEC is mapped within the Project Area. Poplar Box TEC is considered to have a high likelihood of occurrence within the Project Area due to the presence of analogous REs containing *E. populnea* (REs 11.3.2, 11.3.17, 11.4.12, 11.4.7). It is likely the true extent of Poplar Box TEC within the Project Area is substantially lower than what is mapped currently. Woodlands dominated by *E. populnea* have only been observed infrequently during field surveys within the main Project Area extent, generally as open patches along roadsides. Furthermore, based on field survey data collected to date areas associated with RE 11.4.7 are more likely to be dominated by brigalow than poplar box. However, large portions of the riparian vegetation associated with the Dawson River may comprise RE 11.3.2 as per the State RE mapping.

Where assessed, patches have not met TEC status either due to *E. populnea* not dominating the canopy (one area associated with RE 11.4.7) or did not meet condition criteria due to a combination of patch size and ground species composition.

6.4 Terrestrial Habitat Values

The Project Area can be characterised into six terrestrial habitat types based on the findings of the field survey program. The presence and extent of these habitat types is summarised in **Table 6.6** and displayed on **Figure 6.8**.

The 'Exotic pastures and other non-remnant areas' habitat type dominates the Project Area occupying 87%. A detailed description of each habitat type, relevant microhabitat features and associated MNES is provided in the following subsections.

Table 6.6 Summary of Terrestrial Habitat Types

Habitat Type	Extent within Project Area (ha)	Portion (%) within Project Area
Acacia harpophylla (brigalow) woodland +/- gilgai	933.1	4.4%
Riparian open forests of the Dawson River	336.9	1.6%
Eucalyptus on floodplains, natural wetlands ephemeral streams	889.5	4.2%
Eucalyptus populnea and *E. melanophloia* woodland on fine-grained sediments	390.4	1.9%
Farm dams and modified wetlands	227.6	1.1%
Exotic pastures and other non-remnant areas	18,224.5	87%

6.4.1 *Acacia harpophylla* (brigalow) woodland +/- gilgai

This habitat type is characterised by the dominance of *Acacia harpophylla* with or without emergent *Eucalyptus* spp., forming an opened forest and/or woodland (**Photo 6.3**). Within areas where field survey occurred, this habitat type was typically occurring upon gently undulating, cracking clay soils however riparian woodlands were also present.

Within remnant patches, key habitat features of this community include an abundance of fallen logs, coarse woody debris and leaf litter. Grass was typically sparse, although was sometimes abundant within regrowth vegetation where the canopy was open (<30 %). This habitat type often supports gilgai and cracking clays, primary habitat for several reptiles and amphibians including ornamental snake.

Gilgai formations varied in size and depth. In areas of deeper gilgai formations with higher water retention potential, native aquatic vegetation was observed. Waterbirds, including Australian painted snipe have potential to inhabit these areas seasonally when inundated. Within areas of shallower gilgai formations and sparser brigalow cover, naturalised pasture grasses such as buffel grass (*Cenchrus ciliaris**) and Rhodes grass (*Chloris gayana**) occurred. Within regrowth and remnant vegetation types, invasive grass cover was generally low, providing opportunities for ornamental snake to access soil cracks, increasing prey abundance and improving the water holding capacity of the soil. The depth and frequency of soil cracks varied depending on presence of exotic grass cover and impacts from cattle. The presence of weeds, specifically *Parthenium hysterophorus**, was a common occurrence within this habitat. This weed creates thick mats and precludes native species growth.

Confirmed MNES associated with this habitat type include Brigalow TEC, threatened flora species (*Solanum johnsonianum*, *S. dissectum* and *Xerothamnella herbacea*) and ornamental snake. This habitat type may also be associated with Poplar Box TEC, as well as support potential foraging, breeding and dispersal habitat for koala, squatter pigeon (southern), painted honeyeater, Australian painted snipe, and yakka skink.



Photo 6.3 Brigalow habitat and gilgai formations

6.4.2 Riparian open forests of the Dawson River

The Dawson River provides a perennial water source within the Project Area (**Photo 6.4**).
Mature eucalyptus species, primarily *E. tereticornis* and/or *E. camaldulensis,* and sometimes *E. populnea* and *E. coolabah,* form a continuous canopy along riverbanks, whilst *Melaleuca sp.* forms a discontinuous, mid-dense sub-canopy, providing shade and cover within the riparian zone. Large hollow bearing trees and stags occur commonly. During the dry season when flows are reduced, large permanent pools of water are interspersed throughout with abundant exposed tree roots present. Water supported in the pools is generally turbid. Within the river channel, the riverbed substrate is dominated by sandy soils.
The riverbanks comprise areas of clay with shallow cracks and are generally very steep, potentially as a result of streambank erosion during periods of high flow. The ground layer cover was typically high on the upper banks, dominated by exotic grasses such as *Megathyrsus maximus*.*

As the Dawson River is a major and permanent watercourse, it provides a reliable source of water for fauna species in the region, as well as suitable habitat for a range of freshwater turtle species and waterbirds. The observed presence of freshwater mussels provides a potential food source for native species such as rakali (*Hydromys chrysogaster*) and indicates fish species are present, as required for the mussel lifecycle requirements. The age of eucalyptus trees (>70 years old), and access to water provides climatic refugia for fauna species during extended periods of heat as well as providing a food source for folivores such as koala. Where tree-hollows are present, opportunities for nesting or shelter are provided for a range of birds and arboreal mammals.

The Dawson River and associated habitat features provides an important landscape feature and opportunities for connectivity and dispersal to the surrounding region. Lower banks supported macrophytes including *Lomandra* sp. During the most recent survey, the river was full and flowing with a channel width of approximately 60 m. The Dawson River supports historical records for threatened turtle species and wetland birds. This habitat type may support critical habitat for threatened flora species (*Solanum johnsonianum*, *S. dissectum* and *Xerothamnella herbacea*), as well as provide foraging, breeding and dispersal activities for koala; greater glider (southern and central); yellow-bellied glider (south-eastern); squatter pigeon (southern); painted honeyeater; ornamental snake; white-throated snapping-turtle and Fitzroy River turtle. Habitat along the Dawson River in the southern extent of the Project Area may also support critical foraging and breeding habitat for the boggomoss snail.



Photo 6.4 Representative habitat along the Dawson River

6.4.3 *Eucalyptus* on floodplains, natural wetlands and ephemeral streams

Floodplains and associated tributaries of the Dawson River remain in some areas of the Project Area, although, subject to land use changes from agriculture practices (such as land clearing, degradation from cattle, weeds and dieback) (**Photo 6.5**).

Where this habitat remains, *Eucalyptus* species such as *E. coolabah, E. populnea, E. melanophloia, E. tereticornis* dominant the canopy layer and form woodlands to open woodlands. An open shrub layer is also present. The species provide food trees for koala, and where hollows are present, provide sheltering opportunities for gliders. Lower order streams typically provide limited habitat opportunities for aquatic fauna and flora, extensively disturbed from clearing and grazing impacts. These streams may provide some aquatic habitat (albeit limited) during periods of flood when connectivity between to larger systems (e.g. Dawson River) are present. Species richness of aquatic macrophytes is typically low and sparsely distributed. Weeds such as *Parthenium hysterophorus** were prevalent.

In some sections of the floodplains, small ephemeral wetlands (billabongs) occur that are subject to seasonal inundation. These wetlands are often fringed by *E. coolabah.* In the wetland itself, there is minimal vegetation; however, can contain *Juncus* sp. and sparsely occurring grasses. On the margins the ground layer is a mix of exotic and some native tussock grasses. In the wetland depression there are abundant clay cracks, and the margins have abundant timber, leaf litter and shredded thick bark in different size classes.

Confirmed MNES associated with this habitat type include Coolibah TEC. This habitat type may also be associated with Poplar Box TEC and provide potential habitat for threatened flora species (*Solanum johnsonianum*, *S. dissectum* and *Xerothamnella herbacea*). Breeding, foraging and dispersal opportunities may also be supported for koala; greater glider (southern and central); yellow-bellied glider (south-eastern); squatter pigeon (southern); painted honeyeater; Australian painted snipe; ornamental snake; yakka skink; white-throated snapping-turtle; and Fitzroy River turtle. Woodland habitat associated with the Dawson River in the southern extent of the Project Area may also support critical foraging and breeding habitat for the boggomoss snail.



Photo 6.5 Ephemeral wetland (left) and floodplain habitat (right)

6.4.4 *Eucalyptus populnea* or *E. melanophloia* woodland

This habitat type was sampled across the Project Area and often occurred as isolated stands or within road easements. The habitat type occurs primarily on fine-grain sediments, but also on old alluvial plains and clay plains (**Photo 6.6**). Dominant canopy vegetation within this habitat type includes *Eucalyptus populnea* and/or *E. melanophloia*. A mid-dense to dense sub-canopy and/or shrub layer was often also present, with typical species including *Eremophila mitchelli, Acacia* spp., and *Flindersia dissosperma*. *Acacia harpophylla* and sometimes *Casuarina cristata* can form a low tree layer in some areas.

Key habitat features include tree hollows (although usually small is size), structurally complex mid-layer, leaf litter and cracking clay soils. The dominance of a eucalypt canopy provides a food resource for koala. The sandy soils and sparse ground layer provide foraging opportunities for squatter pigeon. The small size of the hollows and isolated nature of the majority of patches renders this habitat largely unsuitable for threatened hollow dependent species such as greater glider (central and southern) and yellow-bellied glider (south-eastern).

This habitat type may be associated with Poplar Box TEC, provide potential habitat for threatened flora species (*Solanum johnsonianum*, *S. dissectum* and *Xerothamnella herbacea*) and provide foraging, breeding and dispersal opportunities for koala; greater glider (central and southern) and yellow-bellied glider (south-eastern) (only where connected to the Dawson River); squatter pigeon (southern); painted honeyeater; ornamental snake; and yakka skink.



Photo 6.6 **Woodland of *Eucalyptus populnea* (left) and *Eucalyptus melanophloia* (right)**

6.4.5 Farm dams and modified wetlands

Waterbodies are present throughout the Project Area, generally comprising small, farm dams (often 1 to 4 ha) (**Photo 6.7**) that are regularly used. Farm dams are generally of low habitat quality; at least one bank is raised and steep, cattle pugging at the water's edge is common and fringing vegetation (aquatic and canopy) is rare. During the field survey, farm dams were found to generally contain only highly turbid water with some common duck species utilising. Water quality within the dams is expected to be poor as a result of the frequent cattle use and disturbance. The largest waterbody (approximately 68 ha) is located within the north-western Project Area. This waterbody is the offstream storage associated with the Moura weir, located along the Dawson River to the northwest. Compared to the other dams, this waterbody offers high quality fauna habitat as it supports fringing canopy vegetation along most of its boundary, common stags within the water (which will eventually fall and provide important submerged microhabitat for aquatic fauna) and aquatic vegetation.

Despite the general poor quality of the farm dams and modified wetlands, it is acknowledged that they may still provide a reliable water source for a range of fauna species, including migratory and threatened waterbirds. The likely permanence of the water also suggests daily water source opportunities may be provided to the squatter pigeon (southern). This habitat type supports potential dispersal and water source opportunities for squatter pigeon (southern) and potential breeding, foraging and dispersal habitat for Australian painted snipe and ornamental snake.



Photo 6.7 Artificial water features: large farm dam (left) and small farm dam (right)

6.4.6 Exotic pasture and other non-remnant areas

This habitat type comprises large areas of land that have been cleared and modified (historically and recently) for grazing or other anthropogenic purposes (**Photo 6.8**). The vegetation supported mostly comprises exotic grassland, with rare to occasional small patches of shrubs (often *Citrus glauca* or brigalow) and/or individual regrowth trees (a variety of species were present but often less than 10 cm DBH). Grasses are typically high-biomass pasture species such as *Cenchrus ciliaris** and *Bothriochloa pertusa**. Canopy and shrub cover is typically very sparse and sparse respectively, whilst ground layer cover is typically very dense but does vary dependent on pressures present. Highly invasive species including *Parthenium hysterophorus** and *Leucaena leucocephala** are dominant in places.

In select areas of this habitat where the soil type supports cracking clays, gilgai formations also occur. Where present, gilgai are generally relatively common but vary in depth and size, sometimes being shallow (<0.5 m) or deep (>0.5 m). Gilgai formations often support herbaceous wetland vegetation including native grasses, sedges and forbs.

Key habitat features include gilgai, which when adjacent to other habitat types such as brigalow woodlands, may afford important connectivity for reptiles such as ornamental snake. When inundated, gilgai may also support waterbirds, including threatened snipe species. This habitat type is typically quite exposed with refuge and shelter opportunities largely limited to shrubs that are suitable for small birds such as fairy-wrens and finches and the occasional small stag (dead brigalow). No large, mature paddock trees that would provide shade or perching opportunities for larger-bodied fauna were recorded during the field survey program.

Although highly disturbed and subject to ongoing threatening processes, it is recognised that parts of this habitat type support potential dispersal opportunities for highly mobile species such as the koala and squatter pigeon (southern), as well potential breeding, foraging and dispersal habitat for Australian painted snipe and ornamental snake (where gilgai and/or cracking clay soils are supported). However, this habitat type overall is considered to have very limited functionality for such MNES, given the vast areas that occur which are completely devoid of shrub or canopy vegetation, the presence of barriers and impediments to movement (described in **Section 6.1.4.3**) and ongoing agricultural development.



Photo 6.8 Non-remnant habitat cleared for pasture

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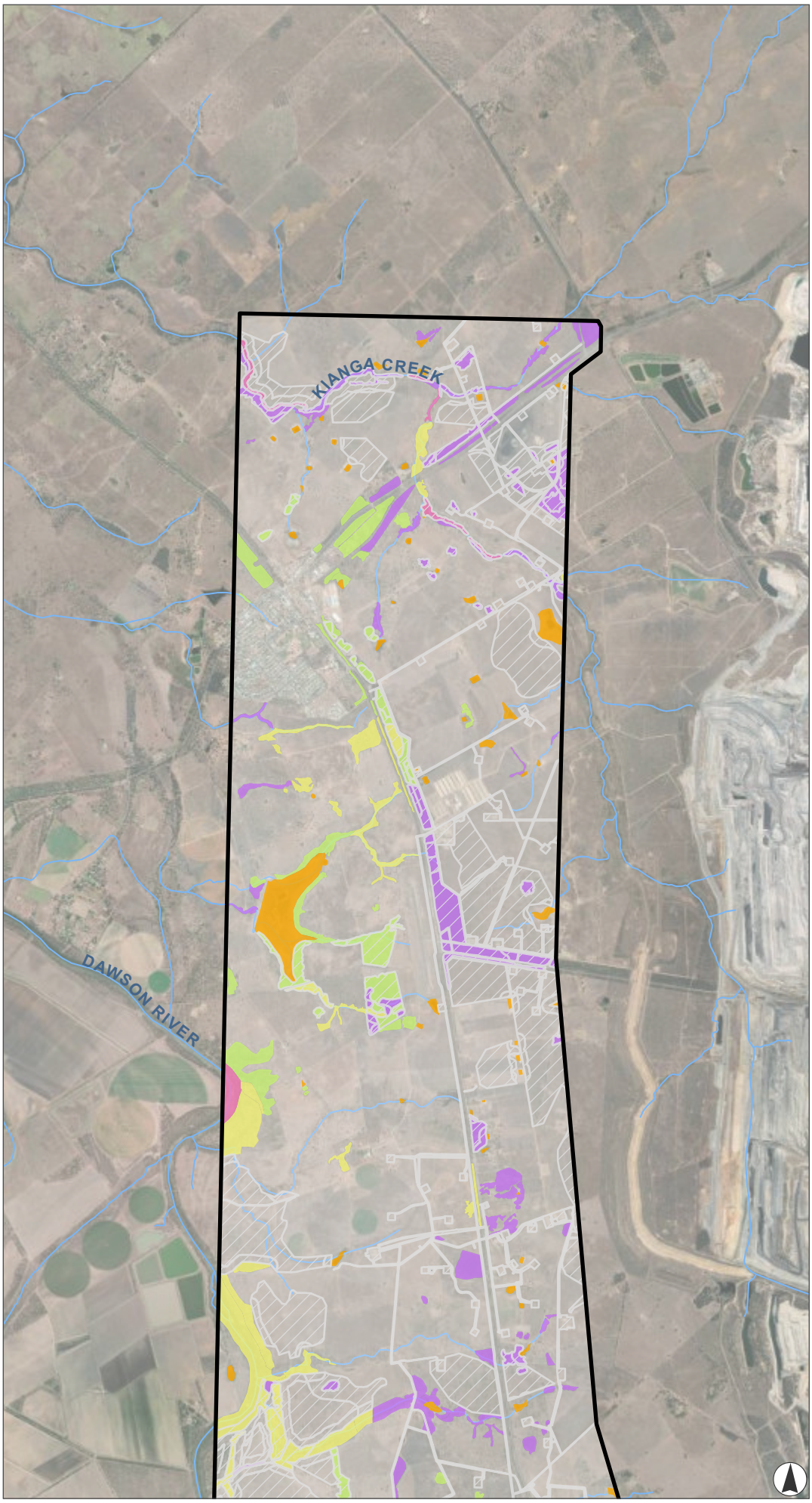
FIGURE 6.8A

Fauna Habitat Types

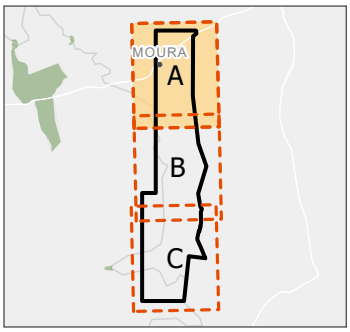


Legend

- Watercourse
- Project Area
- Field Validated Vegetation Mapping

Fauna Habitat Type

- Acacia harpophylla (brigalow) woodland +/- gilgai
- Eucalyptus on floodplains, natural wetlands and ephemeral streams
- Eucalyptus populnea or E. melanophloia woodland
- Farm dams and modified wetlands
- Riparian open forests of the Dawson River
- Exotic pasture and other non-remnant areas



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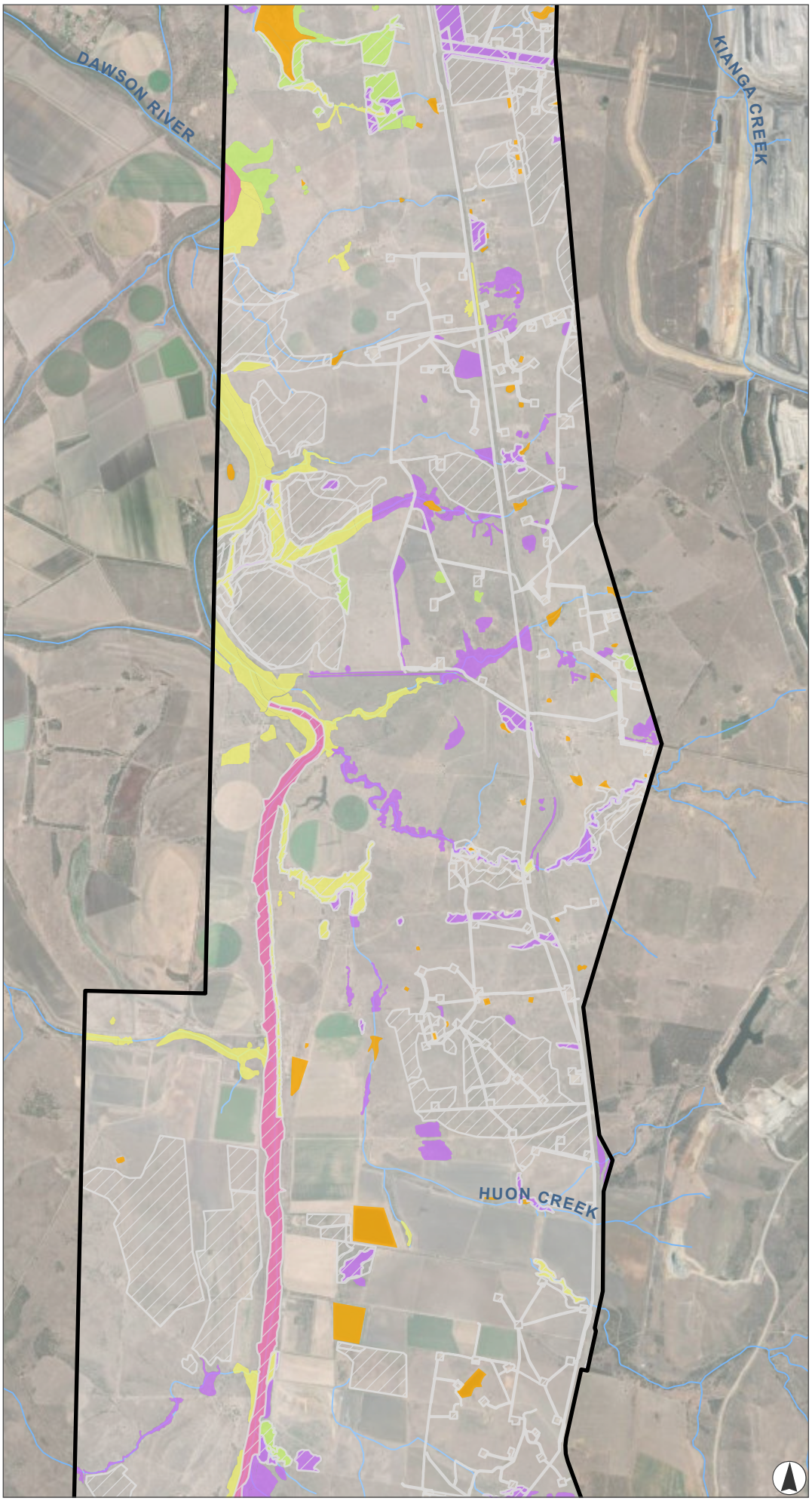


FIGURE 6.8B

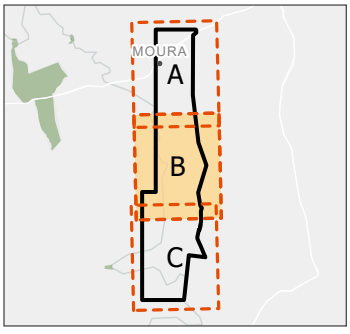
Fauna Habitat Types

Legend

- Watercourse
- Project Area
- Field Validated Vegetation Mapping

Fauna Habitat Type

- Acacia harpophylla (brigalow) woodland +/- gilgai
- Eucalyptus on floodplains, natural wetlands and ephemeral streams
- Eucalyptus populnea or E. melanophloia woodland
- Farm dams and modified wetlands
- Riparian open forests of the Dawson River
- Exotic pasture and other non-remnant areas



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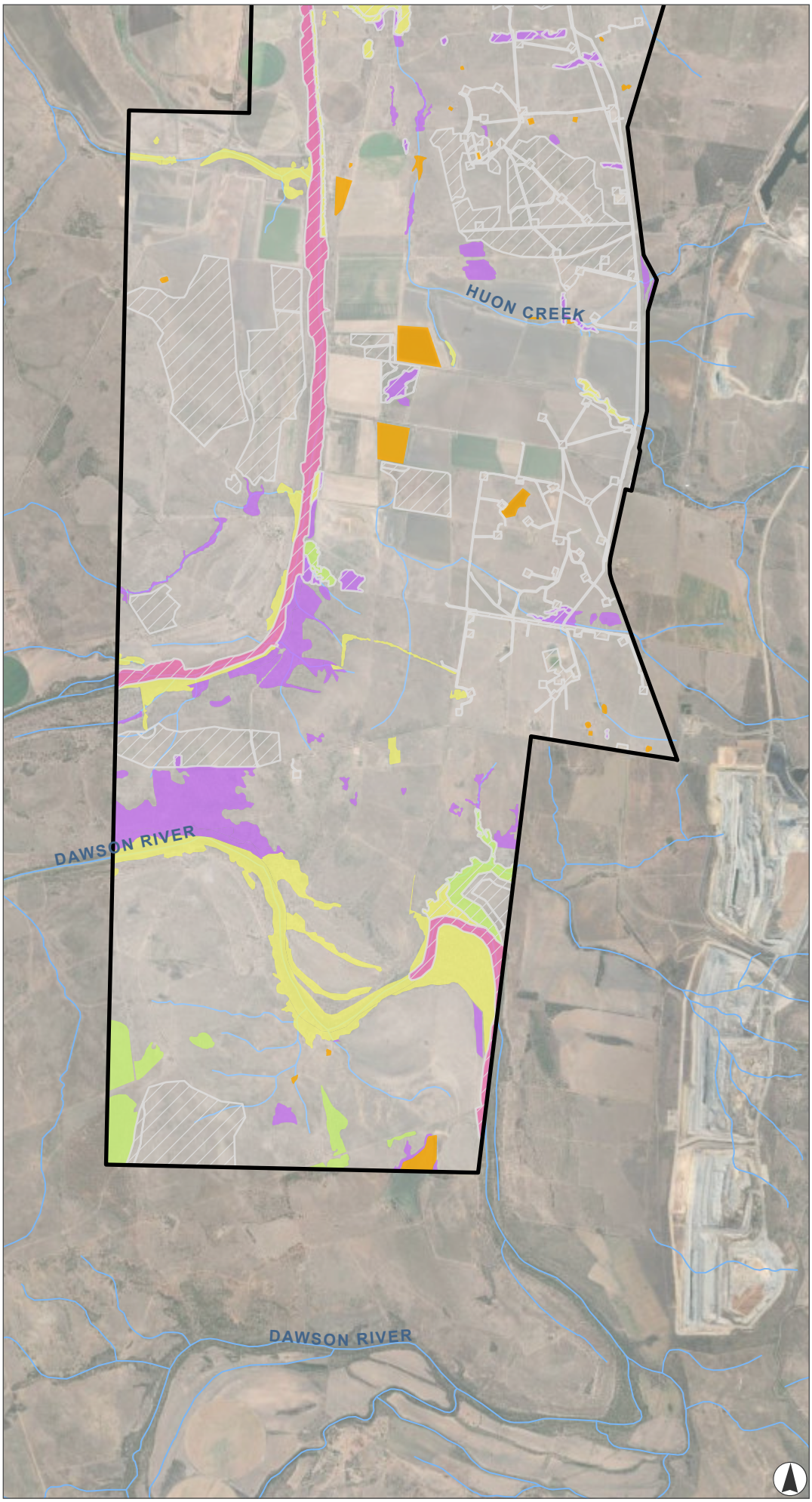


FIGURE 6.8C

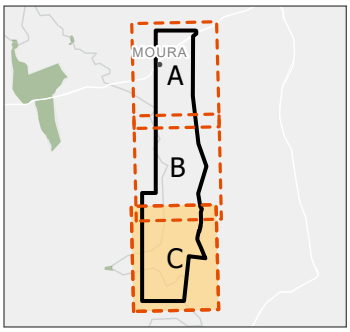
Fauna Habitat Types

Legend

- Watercourse
- Project Area
- Field Validated Vegetation Mapping

Fauna Habitat Type

- Acacia harpophylla (brigalow) woodland +/- gilgai
- Eucalyptus on floodplains, natural wetlands and ephemeral streams
- Eucalyptus populnea or E. melanophloia woodland
- Farm dams and modified wetlands
- Riparian open forests of the Dawson River
- Exotic pasture and other non-remnant areas



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6.5 Species Diversity

6.5.1 Threatened Flora

Three threatened flora species have been confirmed within the Project Area across the field survey program (**Table 6.7**). All three species have been recorded from within brigalow-dominated woodlands. Notable habitat features from these locations included the presence of ground timber (presumably affords protection from cattle trampling), abundant leaf litter and sparse grass cover. The likelihood of occurrence assessment determined that all other threatened flora species identified in the desktop assessment have an unlikely or low likelihood of occurring. The likelihood of occurrence is detailed in **Appendix B**.

Table 6.7 Threatened Flora: Likelihood of Occurrence Outcomes (Known Only)

Scientific Name	Common Name	EPBC Act Status*
Known		
Solanum dissectum	-	Endangered
Solanum johnsonianum	-	Endangered
Xerothamnella herbacea	-	Endangered

** Listing status under the EPBC Act is considered valid as of the referral decision date (30 June 2022).*

6.5.1.1 *Solanum johnsonianum*

Several patches of *Solanum johnsonianum* were observed within vegetation associated with the Gibihi Road reserve during the 2019 and 2023 field surveys. The species was also recorded during the 2024 field survey in one location north of Nipan River Road on private property. Recorded locations comprise brigalow (*Acacia harpophylla*) woodlands in remnant condition analogous to REs 11.4.8 and 11.4.9 and in regrowth analogous to RE 11.3.1.

Recent ALA records (dated 2014, 2015 and 2022) for the species also exist within the far north-eastern Project Area, located immediately north of the Dawson Highway. A historical ALA record (dated 1963) also occurs in the central Project Area, north of Kianga River Road.



Photo 6.9 *Solanum johnsonianum* patch within the Gibihi Road reserve

6.5.1.2 *Solanum dissectum*

Solanum dissectum was observed from one location in the northern portion of the Project Area during the 2019 Umwelt field survey, located west of Kianga Creek. The species was recorded in association with remnant woodland of *Acacia harpophylla* and *Eucalyptus thozetiana* characterised as RE 11.4.9.

One ALA record is found within the Project Area, dated 2015. It is located in the north east corner along the Dawson Highway. Nearby records include one dated 2017 approximately 625 m east of the central region of the Project Area off Theodore Moura Road. Another is approximately 1,041 m east of the Study Area, off Gibihi Road dated 2018, with four other records directly north of the Project Area along Moura Baralaba Road (two dated 2015 and two dated 2014).



Photo 6.10 ***Solanum dissectum***

6.5.1.3 *Xerothamnella herbacea*

Xerothamnella herbacea was confirmed at two locations within brigalow-dominated woodlands along Kianga Creek in the northern portion of the Project Area during the field survey program. ALA records within the Project Area include a cluster of three dated 2015 (one record) and 2022 (two records) along the Dawson Highway, and one record dated 2014 along Kianga Creek. Outside the Project Area, records dated 2010, 2017 and 2018 are scattered both upstream and downstream of Kianga Creek, one record from 2015 occurs off Moura Baralaba Road.



Photo 6.11 ***Xerothamnella herbacea***

6.5.2 Threatened Fauna

The 2020 Umwelt field survey confirmed one threatened fauna species within the Project Area: ornamental snake (listed as Vulnerable under the EPBC Act). The likelihood of occurrence assessment determined that a further four threatened fauna species have a high likelihood of occurring, whilst seven have a moderate likelihood of occurring (**Table 6.8**). The likelihood of occurrence is detailed in **Appendix B**. Details on species distributions, habitat requirements and population are provided for each known, high or moderate occurring species in **Section 9.0**.

Table 6.8 Threatened Fauna: Likelihood of Occurrence Outcomes (Known, High and Moderate)

Scientific Name	Common Name	EPBC Act Status*
Known		
Denisonia maculata	ornamental snake	Vulnerable
High		
Petauroides volans	greater glider (southern and central)	Vulnerable
Phascolarctos cinereus	koala	Endangered
Elseya albagula	white-throated snapping turtle	Critically Endangered
Rheodytes leukops	Fitzroy River turtle	Vulnerable
Moderate		
Geophaps scripta scripta	squatter pigeon (southern)	Vulnerable
Grantiella picta	painted honeyeater	Vulnerable
Hirundapus caudacutus	white-throated needletail	Vulnerable/Migratory
Rostratula australis	Australian painted snipe	Endangered
Egernia rugosa	yakka skink	Vulnerable
Petaurus australis australis	yellow-bellied glider (south-eastern)	Vulnerable
Adclarkia dawsonensis	boggomoss snail	Critically Endangered

** Listing status under the EPBC Act is considered valid as of the referral decision date (30 June 2022).*

6.5.2.1 Ornamental snake

During March 2020, a targeted survey for ornamental snake was undertaken. Four ornamental snakes were confirmed via spotlighting conducted on the night of 24 April 2020, all from the one habitat patch situated within the northern Project Area (**Photo 6.12**). Three of the four individuals were found on bare ground with minimal ground coverage between gilgai water bodies. The fourth individual was found semi-submerged and preying on a green-striped burrowing frog (*Cyclorana alboguttata*). The habitat in this particular location comprised cleared pasture with abundant gilgai and sparse brigalow and sandalwood (*Santalum lanceolatum*) regrowth and is considered suitable for breeding, foraging and dispersal. Disturbance within the area included presence of weeds and evidence of low intensity cattle grazing.



Photo 6.12 Ornamental snake confirmed during the targeted nocturnal survey

6.5.3 Migratory Species

The Umwelt field survey conducted in September 2019 confirmed two migratory fauna species within close proximity to the Project Area:

- Glossy ibis (*Plegadis falcinellus*), recorded on one occasion at a farm dam located approximately 700 m north the Project Area.
- Caspian tern (*Hydroprogne caspia*), recorded on one occasion along the Dawson River approximately 1 km west of the Project Area.

For the purposes of this assessment, the two aforementioned species are considered known to occur. The likelihood of occurrence assessment determined that a further three migratory fauna species have a high likelihood of occurring, and four have a moderate likelihood of occurring (**Table 6.9**). The likelihood of occurrence is detailed in **Appendix B**.

Table 6.9 Migratory Fauna: Likelihood of Occurrence Outcomes (Known, High and Moderate)

Scientific Name	Common Name	EPBC Act Status*
Known		
Plegadis falcinellus	glossy ibis	Migratory
Hydroprogne caspia	Caspian tern	Migratory
High		
Actitis hypoleucos	common sandpiper	Migratory
Apus pacificus	fork-tailed swift	Migratory
Gallinago hardwickii	Latham's Snipe	Migratory
Moderate		
Calidris acuminata	sharp-tailed sandpiper	Migratory
Calidris melanotos	pectoral sandpiper	Migratory
Cuculus optatus	oriental cuckoo	Migratory
Hirundapus caudacutus	white-throated needletail	Vulnerable/Migratory

** Listing status under the EPBC Act is considered valid as of the referral decision date (30 June 2022).*

6.5.4 Introduced Species

Four introduced flora species recorded during field surveys are listed as Weeds of National Significance (WONS):

- *Parthenium hysterophorus** (parthenium)
- *Opuntia tomentosa** (velvet prickly pear)
- *Opuntia stricta** (common prickly pear)
- *Cryptostegia grandiflora** (rubber vine).

Two introduced fauna species have been recorded on numerous occasions throughout the Project Area:

- Cane toad (*Rhinella marina**)
- Pig (*Sus scrofa**).

Due to the high degree of existing disturbance within the Project Area, as well easy access to water resources (dams) and food sources, numerous introduced fauna species are likely to occur, including rabbit (*Oryctolagus cuniculus**), hare (*Lepus europaeus**), cat (*Felis catus**) and dingo/wild dogs (*Canis lupus**). It should also be noted that the township of Moura falls within the Project Area and is likely to be occupied by domestic animals that could further degrade the landscape including domestic dogs (*Canis lupus familiaris**) and cats (*Felis catus**).

6.6 Identified MNES Habitat

Habitat mapping criteria were developed for known and potentially occurring MNES, as described in **Section 4.4.2**. **Appendix C** includes a detailed description of the habitat mapping definitions per MNES, the underlying sources/literature that have informed the definition and any key terms or criteria.

Table 6.10 below outlines how potential habitat per MNES has been mapped within the Project Area to date. It is important to note that habitat mapping presented in this report will be subject to further revision in the future, as the Project progresses and detailed MNES mapping is produced as part of the field scout process (described further in **Section 8.1** and Attachment B of the PD). This approach has been adopted in consideration of the evolving nature of the Project (no firm footprint) and the preference to always have contemporary data informing the presence and extent of MNES.

The table including in **Appendix C** (Table C-1), will be utilised in future field scout investigations within the Project Area to map MNES habitat.

Table 6.10 MNES Habitat Identified within the Project Area

Habitat Definition	Utilisation	Vegetation Condition	Associated REs[4]	Mapping Approach and Field Data Considerations	Extent (ha) within Project Area
Brigalow TEC					
The Brigalow ecological community is characterised by the presence of brigalow (*Acacia harpophylla*) as one of the three most abundant tree species. Brigalow is usually either dominant in the tree layer or co-dominant with other species such as *Casuarina cristata* (belah), other species of *Acacia*, or species of *Eucalyptus*. The ecological community has a considerable range of vegetation structure and composition united by a suite of species that tend to occur on acidic and salty clay soils.	-	Remnant and Regrowth	11.3.1, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.9.1 & 11.9.5.	All patches not field-validated but mapped to comprise an analogous RE >0.5 ha (minimum patch size outlined in condition criteria) are conservatively considered to meet TEC status. Smaller patches that extend beyond the Project Area are also included. These areas will require on-ground assessment against the diagnostic and condition criteria outlined in the communities' Approved Conservation Advice. Patches that have been field-validated and confirmed to not meet TEC status due to diagnostic criteria or condition criteria relating to patch size are excluded.	988.8
Coolibah TEC					
The Coolibah ecological community represents occurrences of one type of semi-arid to humid subtropical woodland where *Eucalyptus coolabah* subsp. *coolabah* (coolibah) and/or *Eucalyptus largiflorens* (black box) are the dominant canopy species and where the understorey tends to be grassy.	-	Remnant and Regrowth	11.3.3	All patches not field-validated but mapped to comprise an analogous RE >5 ha (minimum patch size outlined in condition criteria) are conservatively considered to meet TEC status. Smaller patches that extend beyond the Project Area are also included. These areas will require on-ground assessment against the diagnostic and condition criteria outlined in the communities' Listing Advice. Patches that have been field-validated and confirmed to not meet TEC status are excluded.	105.1

[4] List of REs is based on what has been recorded within the Project Area and mapped by the State government to date. This list may not include the full list of REs that may meet the habitat definition.

Habitat Definition	Utilisation	Vegetation Condition	Associated REs[4]	Mapping Approach and Field Data Considerations	Extent (ha) within Project Area
Poplar Box TEC					
The Poplar Box ecological community is typically a grassy woodland with a canopy dominated by *Eucalyptus populnea* and understorey mostly of grasses and other herbs. The ecological community mostly occurs in gently undulating to flat landscapes and occasionally on gentle slopes on a wide range of soil types of alluvial and depositional origin.	-	Remnant and Regrowth	11.3.2, 11.3.17, 11.4.7 & 11.4.12.	All patches not field-validated but mapped to comprise an analogous RE >1 ha (minimum patch size outlined in condition criteria) are conservatively considered to meet TEC status. Smaller patches that extend beyond the Project Area are also included. These areas will require on-ground assessment against the diagnostic and condition criteria outlined in the communities' Approved Conservation Advice. Patches that have been field-validated and confirmed to not meet TEC status due to diagnostic criteria or condition criteria relating to patch size are excluded.	705.0
Xerothamnella herbacea					
Open forests and woodland habitats where brigalow (*Acacia harpophylla*) dominates or co-dominates on heavy soils. Often in leaf litter and is associated with gilgais.	Suitable habitat	Remnant and Regrowth	11.3.1, 11.3.17, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.9a, 11.9.1 & 11.9.5.	Patches that have been field-validated and confirmed to not contain the species and support a highly disturbed ground layer as a result of extensive cattle grazing and/or incursion from exotic grasses, including but not limited to buffel grass (*Cenchrus ciliaris*) and Guinea grass (*Megathyrsus maximus*), are excluded. As the presence of *Xerothamnella herbacea* is likely influenced by several factors (i.e. climatic conditions, threat presence and severity and time), areas currently excluded but proposed for clearing will still be subject to assessment (field scout) by a suitably qualified ecologist who will assess habitat suitability and complete targeted searches for threatened flora (as well as other known and potentially occurring MNES). If the species is recorded, the patch containing the species will be mapped as habitat.	1,074.9
Any patch of vegetation confirmed via field survey to contain the species.	Known habitat				1.8

Habitat Definition	Utilisation	Vegetation Condition	Associated REs[4]	Mapping Approach and Field Data Considerations	Extent (ha) within Project Area
Solanum dissectum					
Open forests and woodland habitat where brigalow (*Acacia harpophylla*) and/ or lapunyah (E*ucalyptus thozetiana*) characterise the dominant vegetation types on solodic clay soils.	Suitable habitat	Remnant and Regrowth	11.3.1, 11.3.17, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.9a, 11.9.1 & 11.9.5.	Patches that have been field-validated and confirmed to not contain the species and support a highly disturbed ground layer as a result of extensive cattle grazing and/or incursion from exotic grasses, including but not limited to buffel grass (*Cenchrus ciliaris*) and Guinea grass (*Megathyrsus maximus*), are excluded. As the presence of *Solanum dissectum* is likely influenced by several factors (i.e. climatic conditions, threat presence and severity and time), areas currently excluded but proposed for clearing will still be subject to assessment (field scout) by a suitably qualified ecologist who will assess habitat suitability and complete targeted searches for threatened flora (as well as other known and potentially occurring MNES). If the species is recorded, the patch containing the species will be mapped as habitat.	1,075.9
Any patch of vegetation confirmed via field survey to contain the species.	Known habitat				0.9
Solanum johnsonianum					
Open forest and woodland habitats where brigalow (*Acacia harpophylla*) dominates or co-dominates on heavy cracking clay soils. Other associated species include lapunyah (*Eucalyptus thozetiana*) with and understory of wilga (*Geijera parviflora*).	Suitable habitat	Remnant and Regrowth	11.3.1, 11.3.17, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.9a, 11.9.1 & 11.9.5.	Patches that have been field-validated and confirmed to not contain the species and support a highly disturbed ground layer as a result of extensive cattle grazing and/or incursion from exotic grasses, including but not limited to buffel grass (*Cenchrus ciliaris*) and Guinea grass (*Megathyrsus maximus*), are excluded.	1,044.0
Any patch of vegetation confirmed via field survey to contain the species.	Known habitat				32.7

Habitat Definition	Utilisation	Vegetation Condition	Associated REs[4]	Mapping Approach and Field Data Considerations	Extent (ha) within Project Area
				As the presence of *Solanum johnsonianum* is likely influenced by several factors (i.e. climatic conditions, threat presence and severity and time), areas currently excluded but proposed for clearing will still be subject to assessment (field scout) by a suitably qualified ecologist who will assess habitat suitability and complete targeted searches for threatened flora (as well as other known and potentially occurring MNES). If the species is recorded, the patch containing the species will be mapped as habitat.	
Ornamental snake (*Denisonia maculata*)					
Vegetation, generally comprising woodlands and open forests but also non-remnant, associated with 'moist areas' (gilgai and depressions, undulating claypans, lake margins, wetlands and floodplains) that support key refuge microhabitat (i.e. network of soil cracks including deep cracks). Also includes fringing riparian vegetation along watercourses where substitute refuge microhabitat is supported (ground timber and exposed roots). Vegetation functionally connected to moist areas or watercourses that have low-levels, absent or 'impacted' refuge microhabitat may also be suitable if the areas provide temporary foraging opportunities (i.e. support frog habitat) and/or facilitate movement to other areas of suitable habitat.	Suitable habitat	Remnant, regrowth and non-remnant	11.3.1, 11.3.17, 11.3.2, 11.3.25, 11.3.27f, 11.3.3, 11.3.4, 11.3.6, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.9a, 11.5.2, 11.5.2a, 11.9.1 & 11.9.5.	In addition to field data, habitat mapping is informed by several additional datasets including DoR Soil and Land Use Survey of Part of the Dawson Valley mapping (to identify 'gilgaied clays' and 'swamp and wetlands' soil units), DoR Contour mapping (1 and 10 m) and ground-return LiDAR (to identify gilgai formations) and historical aerial imagery (to identify previously occurring brigalow communities). The field survey findings indicate that the composition and quality of suitable habitat for the species varies significantly across the Project Area. However, given the broad nature of the habitat definition, large areas of the Project Area have been confirmed to support habitat. Any patch that is confirmed to contain the species is suitable habitat.	4,849.2

Habitat Definition	Utilisation	Vegetation Condition	Associated REs[4]	Mapping Approach and Field Data Considerations	Extent (ha) within Project Area
Vegetation that is not associated with or connected to 'moist areas' (gilgai and depressions, undulating claypans, lake margins, wetlands and floodplains). Frog habitat is not supported, **and** area **does not** facilitate movement to other areas of suitable habitat. This includes vegetation that has been subject to recent land use change or earthworks (i.e. cropping, tilling or ploughing).	Not habitat	Remnant, regrowth and non-remnant			16,152.8
Koala (*Phascolarctos cinereus*)					
Eucalypt forests or woodlands on alluvial associated with permanent water features (dams, wetlands and/or watercourses) that are resilient to drying conditions, likely to provide a cooler refuge during periods of bushfire and heatwaves.	Climate refugia	Remnant and Regrowth	11.3.2, 11.3.3, 11.3.4, 11.3.25 & 11.3.27f.	Only eucalypt woodlands and open forests on alluvial associated with the Dawson River and the Offstream Storage are considered potential climate refugia. The Dawson River is the only perennial water feature within the Project Area and therefore the only water source likely to provide a reliable resource throughout the year. Water from the Dawson River is diverted to the Offstream Storage by the Moura weir, as described in **Section 6.1.5**. Given the prevalence of agriculture, surface water flows within the main Project Area extent are likely to have been substantially modified as a result of historical land use change and clearing.	948.6
Any forest or woodland that contains Brigalow Belt 'locally important koala trees' (LIKTs, as described by Youngentob, Marsh and Skewes, (2021)) that is not climate refugia.	Breeding and foraging	Remnant and Regrowth	11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.6, 11.3.17, 11.4.3, 11.4.7, 11.4.12, 11.5.2, 11.9.1, 11.9.2, 11.9.7 & 11.9.10.	All areas of mapped REs that meet the habitat definition within the Project Area have been considered to comprise breeding and foraging habitat. Where field validated data is lacking, vegetation composition is inferred based on the communities description in the REDD.	801.0

Habitat Definition	Utilisation	Vegetation Condition	Associated REs[4]	Mapping Approach and Field Data Considerations	Extent (ha) within Project Area
Any forest or woodland community which does not contain LIKTs and may or may not contain Brigalow Belt 'ancillary habitat trees' (as described by Youngentob, Marsh and Skewes, (2021)).	Shelter	Remnant and Regrowth	11.4.8, 11.4.9, 11.4.9a, 11.5.2a & 11.9.5.		800.3
Vegetation that provides a safe intervening ground for the species to move across the landscape (i.e. free from impediments), particularly to and from areas of potential breeding and foraging habitat. This includes non-remnant shrublands and grasslands, which generally support sporadic small stands of trees and/or individual paddock trees. Excludes areas containing infrastructure, active mining areas, cropping, farm dams and other waterbodies as well as areas that are physically inaccessible (e.g. exclusion fencing is present).	Dispersal	Non-remnant	-	Given the broad nature of this habitat, the mapping approach adopted was intentionally conservative as the species is known to disperse distances up to 20 km. Excludes areas containing infrastructure, active mining areas, cropping and farm dams, were confirmed using field data and/or are visible in recent aerial imagery. It is considered highly likely that mapping extent is overstated due to the presence of additional impediments across the Project Area, as indicated by State mapping (including but not limited to roads and irrigation channels).	16,297.0
Painted honeyeater (*Grantiella picta*)					
Woodlands, forests and riparian woodlands dominated by species from the genera *Eucalyptus, Acacia, Melaleuca, Casuarina and/or Callitris*, that support mistletoe.	Foraging and dispersal	Remnant and Regrowth	11.3.1, 11.3.2,11.3.3, 11.3.4, 11.3.6, 11.3.17, 11.3.25, 11.3.27f, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.9a, 11.4.12, 11.5.2, 11.9.1, 11.9.2, 11.9.5, 11.9.7 & 11.9.10.	Mistletoe is a key habitat resource for the species and therefore the patch must contain mistletoe to be considered habitat. Existing field data regarding mistletoe indicates presence across the Project Area is inconsistent and as such no areas have been excluded as potential habitat. This has been done to ensure the estimation of habitat availability is conservative. As the presence of mistletoe may change over time, any area proposed for clearing will still be subject to assessment (field scout) by a suitably qualified ecologist who will complete targeted searches and collect quantitative data regarding mistletoe diversity and abundance.	2,555.4

Habitat Definition	Utilisation	Vegetation Condition	Associated REs[4]	Mapping Approach and Field Data Considerations	Extent (ha) within Project Area
Squatter pigeon (southern) (*Geophaps scripta scripta*)					
Any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species, on sandy, gravelly or loamy soils with patchy perennial tussock grasses or a mix of perennial tussock grasses and low shrubs and forbs (including but not limited to areas mapped as Queensland land zones 3, 5 or 7) and within 1 km of a permanent or seasonal water source with gently sloping banks.	Breeding	Remnant and Regrowth	11.3.1, 11.3.17, 11.3.2, 11.3.25, 11.3.27f, 11.3.3, 11.3.4, 11.3.6, 11.5.2 & 11.5.2a.	Mapped areas include all remnant and regrowth vegetation occurring on land zones 3, 5 or 7 within the designated distance of a suitable water source. Suitable water sources within and adjacent to the Project Area (up to 3 km away) conservatively include all State mapped watercourses, mapped lacustrine wetlands and reservoirs (i.e. farm dams). It is acknowledged that ground layer composition and cover may change over time in response to a number of variables including grazing pressure and rainfall. As such no areas have been excluded as habitat based on existing field data for the ground layer. This has been done to ensure the estimation of habitat availability is conservative. Any area proposed for clearing will still be subject to assessment (field scout) by a suitably qualified ecologist who will complete targeted searches for the subspecies and assess habitat suitability in consideration of the definition. Forest and woodland areas not directly connected or in proximity to a suitable water source or patch of breeding or foraging have been excluded. Non-remnant vegetation included at widths up to 100 m, where connecting to suitable water sources or areas of potential breeding or foraging habitat.	1,577.2
Any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species, on sandy, gravelly or loamy soils with patchy perennial tussock grasses or a mix of perennial tussock grasses and low shrubs and forbs (including but not limited to areas mapped as Queensland land zones 3, 5 or 7) and within 3 km of a permanent or seasonal water source with gently sloping banks.	Foraging				44.6
Any forest or woodland occurring between patches of breeding or foraging habitat that facilitates movement between patches of breeding habitat, foraging habitat and/or water sources, and areas of cleared land less than 100 m wide linking areas of suitable breeding and/or foraging habitat.	Dispersal	Remnant, Regrowth and Non-remnant	11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.9a, 11.9.10, 11.9.12, 11.9.2, 11.9.3, 11.9.4a, 11.9.5 & 11.9.7.		3,055.0

Habitat Definition	Utilisation	Vegetation Condition	Associated REs[4]	Mapping Approach and Field Data Considerations	Extent (ha) within Project Area
Greater glider (southern and central) (*Petauroides volans*)					
Eucalypt forests and woodlands (patches or corridors ≥3 ha) that support potential hollow-bearing trees, comprising habitat or potential habitat REs. Alternatively, REs dominated or co-dominated by the primary associated canopy species (listed below) as per Eyre, Smith, et al. (2022). Eucalypt forests and woodlands that support potential hollow bearing trees but do not align with an RE (i.e. non-remnant communities) may also comprise habitat where dominated by *Corymbia intermedia*, *Corymbia citriodora*, *Eucalyptus tereticornis*, *Eucalyptus portuensis*, *Eucalyptus moluccana* and/or *Eucalyptus crebra*.	Denning	Remnant, Regrowth	11.3.2 (Dawson River only), 11.3.25, 11.3.27f, 11.3.4, 11.5.2 & 11.9.2.	Existing field data has been utilised to the greatest extent practical to accurately characterise the presence and extent of potential habitat, particularly to exclude areas that do not meet the habitat definition due to vegetation characterisation (i.e. brigalow-dominated woodlands). All areas of RE 11.4.8 (a potential habitat RE as per Eyre, Smith, et al. (2022)) are currently excluded based on the existing field data for this community within the Project Area which indicates that brigalow consistently dominates the canopy with eucalypts infrequent. Two REs which are not considered habitat or potential habitat according to the Guide (Eyre, Smith, et al., 2022) (i.e. RE 11.3.2 and 11.3.27f) are currently included as they occur in association with the Dawson River. Areas of RE 11.3.2 mapped as habitat have not been ground-truthed and are anticipated to actually comprise RE 11.3.25 based on existing data. Although no non-remnant eucalypt woodlands were confirmed during the field survey program, it is noted these may occur and could comprise habitat. Accurate tree size and height data for the Project Area is limited; the majority of field survey scopes did not allow for this level of detail to be captured and were completed prior to the latest Conservation Advice being published. As such, a conservative approach to the mapping has been undertaken that considers all identified habitat within the Project Area to be suitable for denning purposes.	1,187.1
Eucalypt forests and woodlands (patches or corridors ≥3 ha) with a canopy height >10 m that do not support potential hollow-bearing trees, comprising habitat or potential habitat regional ecosystems (REs). Alternatively, REs dominated or co-dominated by the primary associated canopy species (listed below) as per Eyre, Smith, et al. (2022). Eucalypt forests and woodlands that do not align with an RE (i.e. non-remnant communities) may also comprise habitat where dominated by *Corymbia intermedia*, *Corymbia citriodora*, *Eucalyptus tereticornis*, *Eucalyptus*	Foraging and dispersal				0.0[5]

[5] This habitat category was unable to be accurately mapped for the purposes of this assessment with the data available. A conservative approach to the mapping has been undertaken that currently considers all identified habitat within the Project Area to be suitable for denning purposes, although it is noted many of the areas identified as denning are most likely foraging and dispersal only. All areas proposed for clearing will still be subject to assessment (field scout) by a suitably qualified ecologist who will assess habitat suitability in consideration of the species habitat definitions, tree DBH and height (>30 cm DBH and >10 m height).

Habitat Definition	Utilisation	Vegetation Condition	Associated REs[4]	Mapping Approach and Field Data Considerations	Extent (ha) within Project Area
portuensis, *Eucalyptus moluccana* and/or *Eucalyptus crebra*.				All areas proposed for clearing will still be subject to assessment (field scout) by a suitably qualified ecologist who will assess habitat suitability in consideration of these habitat definitions, tree DBH and height (>30 cm DBH and >10 m height). For the purposes of this mapping, patch/corridor size and connectivity was assessed using recent aerial imagery and a conservative maximum glide distance of 100 m. Small patches that extend beyond the Project Area boundary were not discounted. The patch was considered isolated (and thus not part of a corridor) if it was separated from habitat by 100 m or greater at the narrowest point, or surrounded by vegetation that does not meet the habitat definition (either utilisation category). The species is not known to utilise other habitat for any part of their lifecycle including dispersal. This includes brigalow woodlands and non-remnant vegetation with isolated trees. Literature on the species maximum glide distance varies significantly, from 40 m (QLD Government, 2024), 75 m (Taylor & Goldingay, 2009) and 100 m (McCarthy & Lindenmayer, 1999 in Norman and Macke, 2024). As such, subsequent field scouts will assess connectivity using tree height data specific to the location and the known gliding angle.	
Yellow-bellied glider (south-eastern) (*Petaurus australis australis*)					
Floristically diverse, mature eucalypt woodlands and forests dominated by smooth-barks or half-barks, comprising patches or corridors ≥50 ha, that may support (now or in the future) large hollow-bearing trees.	Denning, foraging and dispersal	Remnant	11.3.2 (Dawson River only), 11.3.4, 11.3.25 & 11.5.2	As above, existing field data has been utilised to the greatest extent practical to accurately characterise the presence and extent of potential habitat, particularly to exclude areas that do not meet the habitat definition due to vegetation characterisation.	1,039.4

Habitat Definition	Utilisation	Vegetation Condition	Associated REs[4]	Mapping Approach and Field Data Considerations	Extent (ha) within Project Area
				For the purposes of this mapping, patch/corridor size and connectivity was assessed using recent aerial imagery and a conservative maximum glide distance of 140 m. Small patches (i.e. ≤50 ha) that extend beyond the Project Area boundary were not discounted. The maximum gliding distance may be up to 120 m–140m (Kavanagh & Rohan-Jones 1982; Kambouris et al. 2013; Goldingay 2014), though management should be informed by average gliding performance (Goldingay 2014). The patch was considered isolated (and thus not part of a corridor) if it was surrounded by vegetation that does not meet the habitat definition, 140 m wide or greater at the narrowest point. The species is not known to utilise other habitat for any part of their lifecycle including dispersal. This includes brigalow woodlands and non-remnant vegetation with isolated trees.	
White-throated snapping turtle (*Elseya albagula*) and Fitzroy River turtle (*Rheodytes leukops*)					
Permanent waters of rivers and streams with deep pools that may be permanently or periodically inter-connected by shallow riffles.	Breeding and foraging	Remnant	11.3.2& 11.3.25 (Dawson River only)	All riparian vegetation associated with the Dawson River is assumed to provide suitable breeding and foraging habitat for both species. No other watercourses within the Project Area are suitable for the species due to their ephemeral nature, clay substrates and lack of riffle zones, as per field-validated data.	523.9
White-throated needletail (*Hirundapus caudacutus*)					
Includes a range of habitats, although more often over wooded areas, where it is almost exclusively aerial.	Foraging and dispersal	Remnant, regrowth and non-remnant	All REs	Due to the species' aerial nature, the airspace above the entire Project Area may be utilised by the species. As such, the entire Project Area is considered to support habitat.	21,002.1

Habitat Definition	Utilisation	Vegetation Condition	Associated REs[4]	Mapping Approach and Field Data Considerations	Extent (ha) within Project Area
Australian painted snipe (*Rostratula australis*)					
Shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use other 'moist areas' such as inundated or waterlogged grasslands (including those that support gilgai), saltmarsh, dams, rice crops, sewage farms and bore drains. Dominant vegetation in occupied wetlands may include one of more of these elements: grass (e.g. canegrass *Eragrostis australasica*), sedge, and nardoo (*Marsilea* sp.), in sward or tussock form; clumps of rushes or reeds; samphire dwarf shrubland; and open-shrubland of lignum (*Duma* spp.), river cooba (belalie) *Acacia stenophylla*.	Seasonal breeding, foraging and dispersal	Remnant and non-remnant	11.3.27f	Mapped habitat includes all waterbodies (i.e. farm dams and Dawson River offstream) and select areas of non-remnant vegetation containing gilgai. For the purposes of this mapping, only waterbodies ≥0.5 ha or any smaller waterbody that extends beyond Project Area bounds have been considered viable and mapped. This is due to the brownfield nature of the site and the species highly secretive behaviour and preference for concealing habitats as per the National Recovery Plan. The species is not known to utilise major rivers and as such habitat associated with the Dawson River is excluded.	1,354.7
Yakka skink (*Egernia rugosa*)					
Dry sclerophyll forests, woodlands and scrub that support suitable refuge microhabitat including but not limited to, large hollow logs, cavities or burrows under large fallen trees, tree stumps, logs, stick-raked piles, large rocks and rock piles, dense ground-covering vegetation, and deeply eroded gullies, rabbit warrens, tunnels and sinkholes.	Breeding and foraging	Remnant and regrowth	All REs	Based on the findings of the field survey program to date, only patches in remnant condition are likely to support necessary microhabitat. However, a conservative approach to habitat mapping has been adopted with no areas excluded on the basis of vegetation condition or microhabitat field data. Refuge microhabitat including burrow opportunities are a key habitat resource for the species and therefore the patch must contain such to be considered habitat.	2,205.9

Habitat Definition	Utilisation	Vegetation Condition	Associated REs[4]	Mapping Approach and Field Data Considerations	Extent (ha) within Project Area
				As the presence of microhabitat features may change over time, any area proposed for clearing will still be subject to assessment (field scout) by a suitably qualified ecologist who will complete targeted searches for colonies / latrines and collect quantitative data regarding microhabitat presence. The only areas excluded as habitat were patches on creeklines which are likely to regularly become inundated (high risk of flooding burrows).	
Any patch of potential breeding and foraging habitat that has been subject to field assessment (effort appropriate to site size and inclusive of targeted yakka skink search transects / diurnal searches) and determined to not contain any potential burrows or latrine sites.	Not habitat	-	-	This habitat category has not been applied to the mapping produced as part of this assessment, noting that some field survey data is >5 years old. This definition will be relevant to all future field scout assessments, which will be completed by a qualified ecologist and be focused to discrete sites within the wider Project Area.	-
Boggomoss snail (*Adclarkia dawsonensis*)					
Riparian woodlands and forest, monospecific stands of Carnarvon fan palm *Livistona nitida*, open forest fringing ephemeral wetlands on the Dawson River floodplain and artesian mound springs, that support microhabitat including partially buried logs in moist conditions and accumulated leaf litter (including palm fronds) AND occur within the species predicted distribution. Riparian/floodplain woodlands and forests must comprise a 'suitable RE'.	Breeding and foraging	Remnant and regrowth	11.3.2, 11.3.3 & 11.3.25.	As per the habitat definition, the extent of potential habitat has been limited to the species predicted distribution extent included within the SNES (2024) dataset. Although RE 11.3.2 is not known to support the species, it has been conservatively included due to its mapped occurrence along the Dawson River. Until field validation can occur, all patches comprising suitable REs are conservatively considered to contain suitable microhabitat.	159.0

7.0 Potential Impacts

As discussed in **Section 1.1**, no direct impacts to threatened species, migratory species or TECs were anticipated based on the Project details available at the time of the referral (2021/9117). However, since the referral decision, the presence and extent of areas comprising MNES within the Project Area has expanded, reflecting contemporary literature and Commonwealth guidance on MNES. Because of this, some vegetation clearing within mapped MNES habitat is now considered possible.

7.1 Construction Phase

Potential impacts on MNES may arise throughout all phases of the Project (construction, operation and decommissioning) and may include both direct and indirect impacts. The greatest risk of potential impact on MNES values from the Project will occur during the construction phase. The construction activities to support the installation of gas wells, associated distribution gathering lines and access tracks will involve vegetation clearing, trenching or excavation and ground reinstatement. Direct and indirect impacts potentially associated with this are described below.

7.1.1 Direct Impacts

The most significant impacts to MNES generally occur during construction phase activities which require the clearance of vegetation and habitat and associated land disturbance activities (i.e. levelling of ground). Vegetation clearing is a direct impact that can result in the loss of vegetation values and habitat, with the severity of impacts more pronounced in habitats that provide values for threatened species and communities. Potential impacts resulting from clearing native vegetation can include:

- Reduced patch size of vegetation communities potentially compromising the viability of the community and associated habitat.
- Loss of habitat causing a reduction of biological diversity or loss of local populations and genotypes.
- Loss of or disturbance to microhabitat features such as tree hollows, leaf litter, ground timber, dense shrubs and hollows.
- Loss of floristic diversity and the food resources this provides such as foliage, flowers, nectar, fruit and seeds.
- Fragmentation of habitats resulting in reduced dispersal opportunities for fauna.
- Destruction of abiotic features necessary to support vegetation communities and habitat types.

As construction will occur in phases, direct impacts will be limited to a relatively small area within the Project Area at a time. The staging will increase the frequency of direct impacts to values; however, it will substantially reduce the duration of the overall permanent impact by gradually and progressively undertaking the clearing.

It should also be noted that for some MNES, potential habitat includes areas of historically cleared land with little to no material habitat features (i.e. koala dispersal habitat and squatter pigeon (southern) dispersal habitat). Where direct impacts occur to areas that support these types of MNES exclusively, impacts on such MNES are only temporary in nature as the infrastructure location is rehabilitated immediately following the completion of construction. Through rehabilitation, the area is essentially returned to its previous state and the habitat function for those species is reinstated.

As part of the minimisation process, Westside have developed maximum disturbance limits for the MNES habitat relevant to the Project (**Table 7.1**). These limits are cumulative over the life of the Project. At the time of this assessment not all areas within the Project Area had been field validated. However, a conservative and precautionary approach was implemented in the mapping of potential MNES habitat.

Additionally, Project works will not be permissible in areas that have not already been field validated until detailed field scouts have been completed. In the rare event that a greater extent of habitat supporting potential MNES is identified through the field scouts, the Project will be designed to ensure compliance with the maximum disturbance limits. The process will be managed through the Protocol (refer to **Section 8.1**).

Following the identification of a potential development site and the subsequent field scout, the predicted impacts on MNES habitat will be reviewed against the maximum disturbance limits. If MNES identified as unlikely to occur at the time of this assessment are identified, direct impacts on such will not be permissible. Where a limit of 0.0 ha is identified to known or potentially occurring species, no direct impacts on that value are permissible, and therefore will be avoided. For clearing of habitat that is essential for identified MNES, the clearing will not exceed the specified maximum disturbance limits. In all instances, regardless of whether a limit has been specified for a MNES, avoidance will be preferentially undertaken. Since migratory species are not a relevant controlling provision for the Project as per the referral decision, no disturbance limits have been set for migratory species habitat.

The final number, size and location of infrastructure developed progressively over the life of the Project will be influenced by the location of the gas resources identified through ongoing exploration and appraisal activities. Field development will also account for the constraints associated with environmental, land access and cultural heritage values, as detailed in the Protocol.

Table 7.1 Project Maximum Disturbance Limits (no impacts on values in grey)

MNES	Likelihood of Occurrence	Project Area Habitat Utilisation Categories	Total within Project Area (ha)	Direct Impacts Permissible	Cumulative maximum disturbance limit (ha / no. of individuals)
TEC					
Brigalow TEC	Known	-	988.8	Yes	0.9
Coolibah TEC	Known	-	105.1	No	0.0
Poplar Box TEC	High	-	705.0	No	0.0
Flora					
Xerothamnella herbacea	Known	-	1,076.8	Potential habitat only	1.0 ha potential habitat / 0 confirmed individuals
Solanum dissectum	Known	-	1,076.8	Potential habitat only	1.0 ha potential habitat / 0 confirmed individuals
Solanum johnsonianum	Known	-	1,076.8	Potential habitat only	1.0 ha potential habitat / 0 confirmed individuals
Fauna					
Squatter pigeon (southern) (*Geophaps scripta scripta*)	Moderate	Breeding	1,577.2	Yes	1.0
		Foraging	44.6	Yes	1.0
		Dispersal	3,055.0	Yes	40.0
Ornamental snake (*Denisonia maculata*)	Known	Suitable habitat	4,849.2	Yes	16.0
Koala (*Phascolarctos cinereus*)	High	Climate refugia	948.6	No	0.0
		Breeding and foraging	801.0	Yes	2.0
		Shelter	800.3	Yes	6.9
		Dispersal	16,297.0	Yes	400.0
Painted honeyeater (*Grantiella picta*)	Moderate	Foraging and dispersal	2,555.4	Yes	6.9
Australian painted snipe (*Rostratula australis*)	Moderate	Seasonal breeding, foraging and dispersal	1,354.7	Yes	6.0
	High	Denning	1,187.1	No	0.0

MNES	Likelihood of Occurrence	Project Area Habitat Utilisation Categories	Total within Project Area (ha)	Direct Impacts Permissible	Cumulative maximum disturbance limit (ha / no. of individuals)
Greater glider (southern and central) (*Petauroides volans*)		Foraging and dispersal	0.0[6]	Yes	2.0
White-throated snapping turtle (*Elseya albagula*)	High	Breeding, foraging and dispersal	523.9	No	0.0
Fitzroy River turtle (*Rheodytes leukops*)	High	Breeding, foraging and dispersal	523.9	No	0.0
White-throated needletail (*Hirundapus caudacutus*)	Moderate	Foraging and dispersal	21,002.1	NA	No limit[7]
Yellow-bellied glider (south-eastern) (*Petaurus australis australis*)	Moderate	Breeding, foraging and dispersal	1,039.4	No	0.0
Yakka skink (*Egernia rugosa*)	Moderate	Breeding, foraging and dispersal	2,205.9	No	0.0
Boggomoss snail (*Adclarkia dawsonensis*)	Moderate	Breeding, foraging and dispersal	159.0	No	0.0

[6] This habitat category was unable to be accurately mapped for the purposes of this assessment with the data available. A conservative approach to the mapping has been undertaken that currently considers all identified habitat within the Project Area to be suitable for denning purposes, although it is noted many of the areas identified as denning are most likely foraging and dispersal only. All areas proposed for clearing will still be subject to assessment (field scout) by a suitably qualified ecologist who will assess habitat suitability in consideration of tree DBH and height (>30 cm DBH and >10 m height).

[7] This species is a non-breeding migrant to Australia and is mostly aerial, foraging on the wing and moving with weather systems. Based on the species ecology, no clearing limit has been applied.

7.1.1.1 Fauna Mortality

Fauna mortality is another direct impact that may occur to MNES species during the construction phase. Fauna may be injured or killed during construction principally through:

- Strike from moving vehicles/machinery – key issue for ground dwelling species, particularly those with poor mobility.
- Entrapment in habitat during removal – key issue during tree felling for species that use tree hollows or hollow logs for roosting and denning; or for species which utilise subterranean habitat for refuge (i.e. use of soil cracks by ornamental snake).
- Entrapment in trenches/holes – key issue for ground dwelling species (reptiles and small mammals), particularly those that are active at night and cannot detect trenches to avoid.

The potential impact of fauna mortality as the result of the Project is likely to be at a very low frequency given the brownfield nature of the Project Area, the extent and condition of habitat (i.e. cleared pasture and cropping) within areas where vehicles will be regularly traversing and the mitigation measures that will be implemented (spotter-catcher presence during clearing, appropriate speed limits, minimal night works). The impact duration will be limited to the construction period per site, with the impact magnitude likely to be low (rare occurrence of individuals). However, it is noted that this risk profile does differ between species and broader fauna groups. For example, cryptic species that are more likely to stay still when threatened rather than disperse away from the disturbance will have a higher mortality risk.

7.1.1.2 Patch Viability and Functionality

The potential MNES habitat within the Project Area that may be impacted generally consists of small, fragmented patches, which are likely to be already disturbed due to historical clearing and thinning, exotic weeds and cattle grazing. Connectivity across the Project Area is already significantly compromised in many places. However, the Project has the potential to facilitate further fragmentation of these patches via vegetation clearing, as required namely for the construction of the linear components of the Project.

Vegetation clearing can fragment and disconnect vegetation communities, creating or further isolating patches which can impact on the success of seed dispersal, species recruitment and ultimately the long-term viability and persistence of a vegetation community within the landscape. Creating isolated patches and barriers for fauna movement can impact on species recruitment, genetic flow and ultimately the long-term viability and persistence of fauna populations within the landscape. Importantly, the riparian corridor of the Dawson River contains most of the remnant vegetation in the Project Area, which will not be directly impacted by any Project works.

The ecological and conservation value of large patches of vegetation is well accepted. Large patches are needed by many species to maintain viable populations and studies on edge effects have shown that only large reserves can provide high quality “interior” habitat. However, contemporary research is continuing to demonstrate that small patches can be valuable for biodiversity conservation too. These areas may provide complementary value and form an important part of the landscape matrix. In a 2002 study by Fischer and Lindenmayer, it was found that in two different Australian landscapes, relatively small patches contributed strongly to bird species richness. Even patches as small as 1 ha were used by a large proportion of species.

Habitat mapping presented in this report has conservatively assumed that patches 0.5 ha or larger may comprise viable MNES habitat, even where isolated in the landscape. This is a conservative size threshold, with the QLD DES Environmental offset landscape connectivity assessment tool ('the tool') only investigating impacts on patches 1 ha or larger (referred to as 'core' areas). The tool also assumes that edge effects influence up to 50 m from the patch boundary; as such, many small patches particularly if linear in shape can be completely edge-effected.

The landscape fragmentation analysis used by this tool is adapted from the Landscape Fragmentation Tool (LFT) developed by Jason Parent in 2009, with support from Centre for Land Use Education and Research (CLEAR) and the Department of Natural Resources and the Environment, at the University of Connecticut (UCONN). The LFT approach is based on the procedure developed by Vogt et al (2007). The core thresholds are based on minimum viable forest patch size research.

The underlying principles of the tool's tests for impacts on connectivity have been used to develop patch viability and functionality mitigation and management measures, described in **Section 8.2**. As the Project does not have a defined footprint, these measures will ensure potential impacts are appropriately considered when siting infrastructure.

7.1.2 Indirect Impacts

The loss of vegetation and habitat can potentially result in indirect or secondary impacts to the associated fauna and floristic values in the form of habitat degradation. This includes:

- Increased edge effects reducing the condition of quality of remaining vegetation communities and habitat types. This would occur primarily in the few locations where larger intact patches may be disturbed as the majority of the Project Area consists of small, fragmented patches which are likely to be already impacted by edge effects.
- Although exotic weeds are likely to be abundant across the Project Area, further disturbance can permit the establishment and spread of exotic species that may displace native species, native habitat resources and alter fire regimes.
- Soil exposure resulting in an increased risk of erosion and sedimentation of water bodies, reducing water quality and degrading aquatic habitats.
- Increased risk of contamination associated with activities such as refuelling or storage of chemicals.
- Changes in hydrology from installation of infrastructure creating a barrier to surface flow and increasing stormwater run-off.
- Extraction of water from modified wetlands leading to temporary changes in water levels / habitat extent and potentially water quality. Increased activity at these locations resulting in avoidance from some fauna species, and potentially altered foraging and breeding behaviour.
- Generation of dust emissions leading to excessive deposition of dust on leaved of plants suppressing photosynthesis and growth.
- Increased noise and light levels affecting foraging and breeding behaviour for some fauna species or resulting in complete avoidance and displacement from habitats.

- Periodic burst of elevated noise levels may startle and disorientate fauna species within proximity.
- Although the Project will not increase food resources or facilitate the movement of pests via the creation of new pathways, increased anthropogenic activity may lead to temporary increased pest levels.

7.1.2.1 MNES-specific Indirect Impacts

All MNES are susceptible to these indirect impacts to some degree; however, some are known to be more susceptible than others, or some of these indirect impacts have been identified as key threatening processes for the MNES. The susceptibility of the specific MNES values identified within the Project Area to the potential indirect impacts is outlined in **Table 7.2**. Although the assessment of indirect impacts should not be understated, it's important to note that many of these impacts are already present in the Project Area. For example, indirect impacts such as noise disturbance associated with water extraction already occurs through water extraction for agricultural purposes and for the adjacent Dawson Mine.

For MNES identified as unlikely, no indirect impacts are anticipated to occur due to the lack of potential presence of these values within the Project Area and associated habitat. It is noted that not all areas within the Project Area have been field validated.

The indirect impacts discussed above in **Section 7.1.2** predominantly relate to actions such as vegetation clearing that have clear and discernible direct impacts. Other Project activities are also acknowledged to have the potential to indirectly impact Project Area MNES including 'low impact petroleum activities' and HDD. HDD is a construction method for gathering infrastructure that will only be employed when it will allow an area to be traversed without the need to clear vegetation (i.e. crossing a watercourse). Based on the known information regarding the directional drilling method, the risk of indirect impacts on MNES are considered very low. As described in **Section 2.1.2**, this method is widely used primarily because of the environmental benefits associated with it (when compared to traditional methods). The Project has also adopted additional controls (see **Section 8.2.1**) to manage potential risks associated with this method.

'Low impact petroleum activities' (a term specific to the Project's State EA) are also considered to have a very low risk of indirect impacts. Low impact petroleum activities are authorised resource activities which do not result in the clearing of native vegetation, cause disruption to soil profiles through earthworks or excavation or result in significant disturbance to land which cannot be rehabilitated immediately using hand tools after the activity is completed. Examples of such activities include but are not necessarily limited to soil surveys (excluding test pits), topographic surveys, cadastral surveys and ecological surveys, may include installation of monitoring equipment provided that it is within the meaning of low impact and traversing land by car or foot via existing access tracks or routes or in such a way that does not result in permanent damage to vegetation. The primary indirect risk related to such activities would be trampling of immobile MNES (i.e. threatened flora individuals and the boggomoss snail).

Whilst a conservative and precautionary approach has been implemented in the likelihood of occurrence assessment and subsequent mapping of potential MNES, in the unlikely event that these values are actually found to be present, the Project will be designed to ensure avoidance. As such for these values, impacts, including indirect impacts will not be permissible. The process will be managed through the Project's Protocol with field scouting aiming to identify any MNES habitat present (refer to **Section 8.1**).

Table 7.2 MNES at Risk of Indirect Impacts Associated with the Construction Phase

Indirect Impact	Relevant MNES	Potential Impact	Frequency	Duration	Magnitude
Edge effects causing habitat degradation	TECs	Habitat degradation could result in areas within the Project Area dropping below required condition thresholds to meet TEC status.	Infrequent – substantial cleared areas within the Project Area which will allow for siting to occur away from existing habitat.	Permanent – throughout lifetime of infrastructure and post rehabilitation.	Localised / low – will only effect edges of habitat. Most habitat within the Project Area is already highly impacted by edge effects.
	Threatened flora species Threatened fauna species	Threatened flora and fauna species can be affected by edge effects due to: • Modification of microclimate where new edges are created due to greater penetration of light and wind into the vegetation. • Physical disturbance to vegetation at the edge. Ongoing damage to the edge of vegetation may occur due to grazing and weed control of road edges and vehicle use. Similarly, unsealed tracks can facilitate an increase incident of fire regimes. • Changes to soil properties including compaction of the soil, less organic matter and increased erodibility. • Introduction of weeds and pathogens through mud and dirt which falls off vehicles. • Exacerbation of the impact of aggressive exclusion of birds from woodland and forest habitat by noisy miners which are present within the Project Area. This is a Key Threatening Process under the EPBC Act.			
Weed and pest incursion	TECs Threatened flora species	Encroachment of exotic pasture grass could result in an increase of fuel loads and more incidence of high intensity fires within the TEC or retained threatened flora habitat. Although the Project is highly unlikely to lead to increased pest animal populations, increased access by ungulates such as feral pigs, horses and cattle, could lead to further trampling, overgrazing and damage to the understorey and recruiting potential of the TECs and threatened flora species potentially occurring in the Project Area.	Infrequent / periodic - fluctuate seasonally and with land management practices or breaches in general construction protocols (weed washdowns etc.).	Temporary – outbreaks addressed via general land management obligations under State laws.	Localised, but could extend to the broader Project Area if unmanaged. Magnitude also considered low given existing condition of habitat is already impacted by weeds and pests.
	Squatter pigeon (southern)	The squatter pigeon (southern) is predominantly ground dwelling species. The species is highly susceptible to predation from exotic predators including feral cats and foxes. With the implementation of best practice weed and pest mitigation measures, it is considered unlikely the Project will lead to a notable increase in pest populations.			

Indirect Impact	Relevant MNES	Potential Impact	Frequency	Duration	Magnitude
	Koala	Any potential increase in dingo or wild dog populations as a result of the Project could threaten the local koala population. However, as above it is considered unlikely the Project will lead to a notable increase in pest populations.			
	Yakka skink	Individuals utilising the Project Area will be highly susceptible to an increase in pest predator species such as feral cats, cane toads and foxes. As above, it is considered highly unlikely the Project will lead to a notable increase in pest populations.			
	Boggomoss snail	Individuals utilising the Project Area will be highly susceptible to an increase in pest predator species such as feral cats, cane toads, foxes, house mouse and feral rats. Additionally, feral pigs effectively root up the ground searching for food, including snails. As above, it is considered highly unlikely the Project will lead to a notable increase in pest populations. Weeds have the potential to alter both the lower shrub layer and consequent litter as well as contributing to an increased fuel load.			
	Australian painted snipe	Quality and availability of foraging resources are directly related to condition of aquatic habitat and therefore increased weed incursion could impact on species habitat in the Project Area. These species are also high susceptible to predation however the Project is considered highly unlikely to lead to a notable increase in pest populations.			
	Ornamental snake				
	Fitzroy River turtle	Weeds can cause infestations at nest sites making it more difficult for turtles to access their preferred nesting sites. Eggs and hatchlings may also be threatened by fox, feral pig, feral cat and dog predation.			
	White-throated snapping turtle				
	Painted honeyeater	Predation by invasive species (e.g. black rats) is noted as a threat to the species.			
	Greater glider (central and southern)	Predation by feral cats and foxes are noted as threats to both species.			

Indirect Impact	Relevant MNES	Potential Impact	Frequency	Duration	Magnitude
	Yellow-bellied glider (south-eastern)				
Erosion, sedimentation and reduced water quality	Fitzroy River turtle	Increasing turbidity and sedimentation may affect food resources and cloacal respiration. Pollution of water and soil by surrounding land uses may also pose a threat to populations.	Infrequent / periodic - fluctuate seasonally and with land management practices or breaches in general construction protocols.	Temporary – limited to once off incident or rectified through seasonal inundation diluting to background levels given the ephemeral nature of most waterbodies.	Localised / low – will only effect immediate area. Most habitat within the Project Area is already highly impacted by erosion and reduced water quality.
	White-throated snapping turtle				
	Australian painted snipe	Quality and availability of foraging resources are directly related to condition of aquatic habitat and therefore any reduction in water quality could impact on species habitat in the Project Area.			
	Ornamental snake				
	Greater glider (southern and central)	Although unlikely, erosion and alteration of riparian zones may lead to the loss of canopy vegetation. These trees may contain hollows which are necessary for the breeding of arboreal mammals. Trees may also be important for maintaining shelter and connectivity along the watercourse.			
	Yellow-bellied glider (south-eastern)				
Elevated dust	TECs	Extended periods of dust deposition could threaten the health and viability of potentially present individuals and vegetation communities. The implementation of dust management as deemed necessary and in response to conditions will limit the chances of construction dust having an adverse impact on vegetation.	Infrequent – associated with breaches in general construction protocols. Frequency is likely to be higher within the access road corridor.	Temporary – Potential impacts rectified through active management or through natural processes such as rainfall.	Localised / low – will only effect immediate area.
	Threatened flora				

Indirect Impact	Relevant MNES	Potential Impact	Frequency	Duration	Magnitude
Noise and light disturbance	Nocturnal MNES	Increased lighting within or adjacent to potential habitat within the Project Area could increase the success of predation by visual predators (including exotic pests) or could alter foraging and breeding behaviours. Construction noise or vibration during the day may disturb denning or roosting individuals and negatively affect circadian rhythms.	Occasional – minimal night work however noise, light and vibration as a result of construction works have the potential to disrupt fauna species.	Temporary – construction will occur in discreet areas over a period of 30 years.	Localised – restricted to the confined worksite.

7.2 Operation and Maintenance Phase

Potential direct and indirect impacts on MNES associated with the operation phase of the Project are considered to be minor.

Coal seam gas extraction will be the main activity that occurs during this phase of the Project that may pose risk to MNES communities and habitat. As part of the gas extraction process, wells are drilled through the coal seams and the water pressure is reduced by extracting some of the water. This groundwater extraction may affect the quality and reduce the quantity of groundwater in adjacent aquifers that may be used for town water supply, irrigation, or by springs and other ecosystems. Environmental impacts may also occur from the storage and disposal of extracted groundwater and the effects of chemicals used in drilling.

To understand the nature and extent of potential impacts on groundwater during operation of the Project, a groundwater impact assessment was prepared for the Project by KCB Australia in 2021. The assessment considered the potential impact to water resources and water-dependent assets under the EPBC Act with reference to relevant assessment guidelines including 'Significant impact guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources', '*Significant impact guidelines 1.1 – Matters of National Environmental Significance'* and the *Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development* (the IESC) information guidelines.

KCB Australia (2021) concluded that the proposed development of the Project will not have a significant impact on water resources. No discernible impacts to potential terrestrial GDEs are predicted, based on the limited drawdown predicted in the hydrostratigraphic units that could provide groundwater to the potential GDEs.

Westside have also completed a produced water storage risk assessment for the Project that considers potential impacts to surface water and groundwater as a result of an unplanned release, which was provided to DCCEEW in 2022. With proposed controls in place, all of which are contained within Project management plans and systems, the residual risk of impact on the surrounding environment was considered low. The beneficial use of produced water including for dust suppression and irrigation is strictly managed via Westside's Produced Water Management Plan (MSG-GN00-HS-PLN-002), ensuring there is a low risk of potential indirect impacts on MNES.

The use, storage, transport and disposal of chemicals, fuels and other pollutants may also be required at times during the operation of the Project. Project activities that utilise chemicals, fuels and other pollutants will be carefully planned and follow strict industry-standard protocols. Specific consideration will be given to the location of sensitive receptors and environments present in the vicinity and the potential for indirect impacts on such values. Contingencies will be in place to ensure any accidental release or spill is immediately detected and managed, with corrective actions taken immediately.

Existing chemical storage facilities occur within the Project Area and will be utilised for Project purposes. These were strategically located to avoid watercourses and maximise containment to the immediate area. The Project will employ a suite of mitigation and management measures relevant to managing chemical risks, which are outlined in Westside's Environmental Management Plan (EMP) (WCL-0000-HS-PLN-000). The potential risks to the environment relating to the use of chemicals and other pollutants during operation of the Project was assessed via a Project-specific risk assessment (EHS, 2021), which found the residual risk of impacts low given the controls in place.

Other activities that will occur during this phase are limited to periodic inspection and/or maintenance in the same area previously disturbed during construction. Traversing maintenance vehicles may inadvertently introduce weeds and potentially collide with ground dwelling MNES resulting in injury or mortality. Any impacts would be mitigated through implementation of the EMP (WCL-0000-HS-PLN-000) and specific controls like weed hygiene procedures and site speed limits.

7.3 Decommissioning and Rehabilitation Phase

Similar to the operational phase of the Project, decommissioning and rehabilitation activities are also considered to have only minor and temporary impacts on MNES values as they will be completed progressively until the Project's closure. Other than for surface rehabilitation, no ground disturbance will occur as subsurface components of the gathering network will remain in-situ. Any ground disturbance required will be restricted to existing infrastructure locations (i.e. areas previously disturbed during construction).

Temporary and localised increases in noise and potentially dust may occur, but will be managed using the same methods used during construction. Traversing vehicles required to complete decommissioning or rehabilitation activities may inadvertently introduce weeds and potentially collide with ground dwelling MNES resulting in injury or mortality. Any impacts would be mitigated through implementation of the EMP and specific controls like weed hygiene procedures and site speed limits.

8.0 Avoidance, Mitigation and Management

8.1 The Protocol

Westside will adopt the hierarchy of management principles when planning for and implementing new petroleum activities within the Project Area that may result in land disturbance. In order of preference, Westside will seek to:

- Avoid – avoid direct and indirect adverse environmental impacts to MNES values.
- Minimise – minimise direct and indirect adverse environmental impacts to MNES values where disturbance to MNES habitat cannot reasonably and practically be avoided.
- Mitigate – mitigation and management measures for both direct and indirect impacts to MNES values for the Project in accordance with the Significant Species Management Plan.
- Rehabilitate – actively rehabilitate all disturbed areas in accordance with the Project's EA and Rehabilitation Management Plan.
- Offset (only where required) – provide suitable offsets for areas of impact that result in significant residual impact to MNES.

The Protocol (Attachment C of the PD) is a management plan that provides a framework to implement this management hierarchy. It will be implemented by Westside throughout the life of the Project. Within the Project Area, the Protocol will dictate which activities are permissible and guide infrastructure siting to:

- Prioritise locations for development that do not support MNES habitat.
- Avoid or minimise disturbance to MNES habitat to the maximum extent practicable.
- Ensure ongoing compliance with maximum disturbance limits for identified MNES habitat (see **Section 7.1**).

The Protocol will be implemented via the Westside Project Execution Process. This process, comprised of four key phases, provides a thorough assessment of all the relevant constraints, risks and opportunities from the inception to the execution of Project activities. Hold points or 'gates' occur at the end of each phase, allowing for re-assessment of risks and opportunities as well as compliance before the next phase in the process can begin. **Figure 8.1** below provides an overview of the four phases with further details available in Section 4 of Attachment C of the PD.

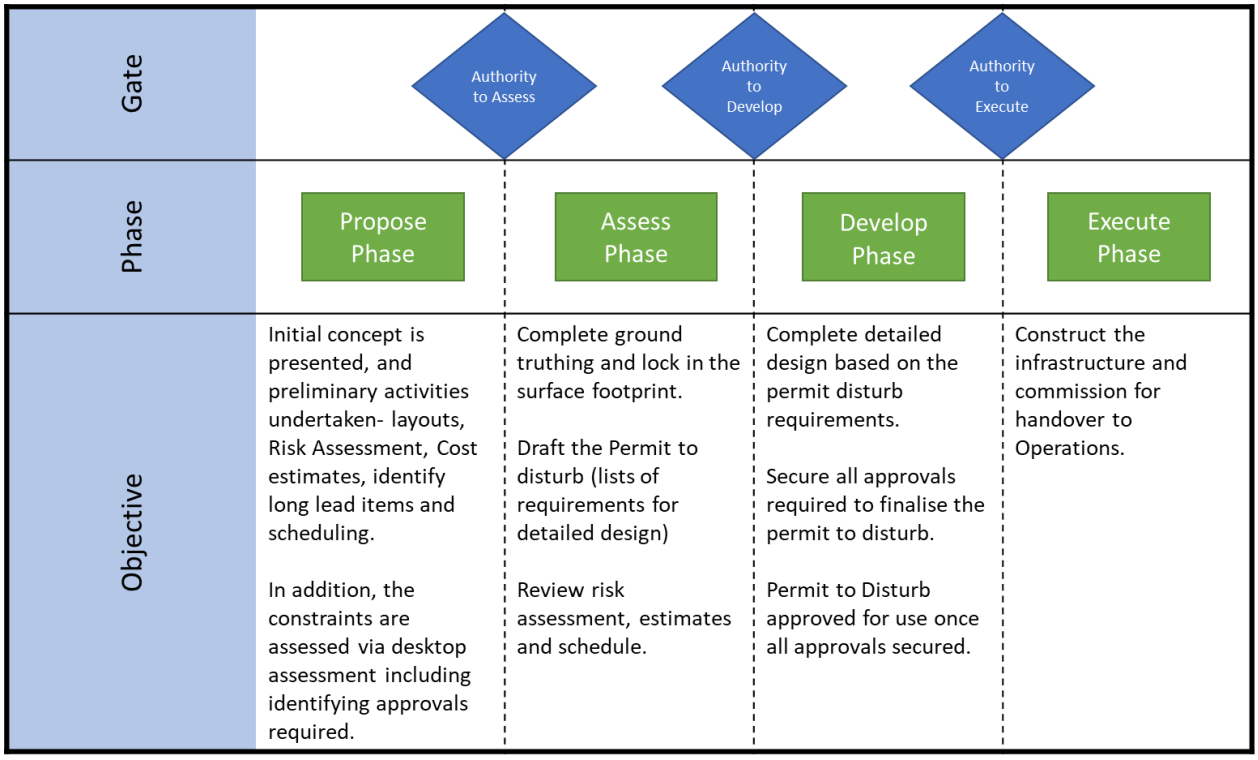

Figure 8.1 High-level Gated Process (Westside Project Execution Process)

8.1.1 Propose Execution Phase

Initial consideration of MNES habitat (one of several potential on-ground constraints) within the Project Area during the Propose phase will occur via desktop review of the MNES habitat mapping detailed in this report. As described in **Section 4.4.2**, MNES habitat mapping has been developed for the Project Area using habitat mapping rules informed by the latest species' information including DCCEEW guidance documents including approved Conservation Advice documents. The mapping applies the precautionary principle noting that field validation has not been practicable across the full extent of the Project Area at this time. Areas of MNES habitat will be grouped into constraint categories, as detailed below in **Table 8.1**.

Areas of avoidance are aligned to the hierarchy of constraints. For example, no-go areas must be avoided first, followed by high constraint areas, then moderate constraint areas, in respective order. Following ground-truthing of ecological values via the field scout, Project design will be re-assessed in accordance with **Table 8.1**.

Table 8.1 Project Area Constraints Categories

Constraint Category	Constraint	Activities Permitted
No-go	• Township of Moura. • Areas that have been identified as no-go due to Cultural Heritage exclusion/conservation zones. • Confirmed individuals of *Xerothamnella herbacea*, *Solanum dissectum*, *Solanum johnsonianum* inclusive of a 5 m buffer zone. • Boggomoss snail habitat that has been confirmed via field scout.	No works permitted.
High	• Confirmed or potential habitat for the MNES listed in **Table 7.1** as having 0.0 ha cumulative maximum disturbance limit. Includes all habitat for critically endangered MNES. • The Dawson River.	Surveys with no ground disturbance only (i.e. low impact petroleum activities[1]).
Moderate	• Watercourses and wetlands[1] (including farm dams). • Habitat categories for MNES (excluding dispersal habitat for koala and squatter pigeon (southern)) with cumulative maximum disturbance limits >0.0 ha. Direct impacts permitted up to the cumulative maximum disturbance limit only.	Low and essential petroleum activities[1] – cumulative maximum disturbance limits apply.
Low	• Dispersal habitat for koala and squatter pigeon (southern). Direct impacts permitted up to the cumulative maximum disturbance limit only. • All other environmental constraints (non MNES).	All petroleum activities[1] – cumulative maximum disturbance limits apply.

[1]: As defined in Schedule K of the Project's EA.

In addition to MNES constraints, it is acknowledged that there are other constraints outside the scope of this assessment that must also be considered during infrastructure siting. These constraints include landholder agreements, constructability restrictions, presence of sensitive receptors and cultural heritage (indigenous) requirements. The development needs will be balanced against all constraints, including the implementation of the Protocol, while ensuring that activities are compliant with all legal obligations.

8.1.2 Assess Execution Phase

During the Assess phase, MNES habitat mapping will be subject to further ground-truthing via field scouts which will be completed by a suitably qualified ecologist. The field scout will consider the full list of known and potentially occurring MNES within the Project Area as outlined in this report. As necessary, the MNES mapping will be updated to reflect the findings of the field scout. At each field scout location, the MNES habitat assignments and constraint categories boundaries will be updated should:

- Any threatened species or community (listed under the EPBC Act at the time of the decision on the referral – 30 June 2022) not already addressed in **Table 7.1** found to be present within the Project Area. Constraint category should be changed to 'no-go'.
- New areas of MNES habitat or alternate habitat utilisation categories for a relevant MNES are identified from field scout surveys.
- MNES habitat is identified not to be present during field scout surveys. Constraint category should be changed to 'low'.

If additional suitable habitat is identified, it will be avoided pursuant to the constraints hierarchy outlined in **Section 8.1**.

The final number, size and location of infrastructure developed progressively over the life of the Project will be influenced by the location of the gas resources identified through ongoing exploration and appraisal activities. Field development will also account for the constraints associated with environmental, land access and cultural heritage values, as detailed in the Protocol.

8.2 Mitigation and Management

Throughout the life of the Project, potential impacts on MNES will be directly or indirectly managed via Westside policies, procedures and management plans, including:

- The Protocol (MSG-GN00-HS-PLN-003)
- Permit to Disturb Procedure (WCL-0000-HS-PRC-036)
- EMP (WCL-0000-HS-PLN-000)
- Significant Species Management Plan (SSMP) (MSG-GN00-HS-PLN-005)
- Produced Water Management Plan (MSG-GN00-HS-PLN-002)
- Rehabilitation Management Plan (WCL-0000-HS-PLN-011)
- Soils Management Plan (WCL-0000-HS-PLN-010)
- Noise Management Plan (WCL-0000-HS-PLN-009)
- Erosion and Sediment Control Procedure (WCL-0000-HS-PRC-029)
- Weed Management Procedure (WCL-0000-HS-PRC-034)
- Biosecurity Management Plan (WCL-0000-HS-PLN-010-010).

As Westside have existing operations within the Project Area, these documents have already been developed. All management plans will undergo a thorough review and update process biennially or following a significant incident or non-compliance, starting from the Project initiation date and continuing until completion (i.e. post decommissioning and rehabilitation). Updates will be made as necessary to ensure alignment with circumstances and evolving governmental and industry requirements. However, the management plans are currently founded in the following standards and codes:

- Australian Standard AS2885 – Pipelines Gas and Liquid Petroleum
- Australian Standard AS3580 – Methods for Sampling and Analysis of Ambient Air
- Australian Pipelines and Gas Association Ltd (APGA) Code of Environmental Practice
- ANZECC Australian Guidelines for Water Quality Monitoring and Reporting (2000)
- APIA Code of Environmental Practice: Onshore Pipelines (2009)

- Code of Practice: For the construction and abandonment of coal seam gas and petroleum wells, and associated bores in Queensland (DNRME, 2018)
- Geoscience Australia Groundwater Sampling and Analysis – A Field Guide (2009:27 GeoCAt #6890.1)
- Queensland Government Noise Measurement Manual (2020)
- Queensland Manual for assessing Consequence Categories and Hydraulic Performance of Structures (ERS/2016/1933)
- Queensland Government Monitoring and Sampling Manual: Environmental Protection (Water) Policy (2018)
- Queensland Air Quality Sampling Manual and/or Australian Standard 4323.1:1995 Stationary source emissions method 1: Selection of sampling positions, as appropriate for the relevant measurement
- Guidelines for Surveying Soil and Land Resources, 2nd edition (McKenzie et al. 2008), and/or the Australian Soil and Land Survey Handbook, 3rd edition (National Committee on Soil and Terrain, 2009).

Once approved by Westside and any relevant stakeholders or regulatory bodies, any changes to the plans will be promptly communicated to all site personnel via email notifications, daily toolbox talks and notices in common areas. Additionally, updated versions will be stored in a designated folder accessible to all relevant team members.

The mitigation measures relevant to the Project and the above documents are summarised in **Section 8.2.1** and **Section 8.2.2**. Mitigation and management measures relevant to MNES have been developed utilising available best practice guidance or informed by statutory or policies, where available.

All measures have been developed to be consistent with the S.M.A.R.T principle, ensuring they are:

- **S**pecific – prescriptive, with no uncertainty or ambiguity around their purpose or implementation.
- **M**easurable – the status (i.e. success or failure) and outcomes/results can be measured.
- **A**chievable – through the chosen method of implementation, by the responsible personnel and within the specified timeframe.
- **R**elevant – to the action/impact being controlled and to the protected matter.
- **T**ime bound – Measures were given specific and achievable timeframes for implementation in relation to specific development activities or stages.

8.2.1 General Mitigation Measures

A number of general mitigation measures included in the Project's EA (**Appendix D**), EMP and SSMP are relevant to the management of potential impacts on MNES. Whilst not necessarily species-specific, key to minimising impacts to MNES is reducing the scale and magnitude of impacts. As such, where an impact is proposed, the following key reduction methods will be undertaken to minimise impacts to the greatest extent possible:

- Areas of pre-existing disturbance (as defined in the Project's EA) and other low constraint (koala dispersal habitat, squatter pigeon (southern) dispersal habitat and areas not identified as MNES habitat) will be utilised to site infrastructure to the maximum extent practicable to reduce disturbance impacts to other MNES. Where use of these areas is not safe or feasible, disturbance of moderate constraint areas will only occur where no other feasible construction options exist and in accordance with cumulative disturbance limits (refer to **Section 7.1.1**) and patch viability siting rules (see dot point below). This decision must be documented, sufficiently justified and approved by Westside.

- To ensure patch viability and functionality is maintained at current levels, the siting of Project infrastructure (including wells, gathering infrastructure, tracks and other ancillary infrastructure) within or adjacent to moderate constraint areas must also adhere to the following rules:

    - Patches that are 0.5 ha or less must be completely avoided by the Project (no direct impacts permitted).

    - Patches that are 1.0 ha or less must not be dissected in a way that creates two or more new patches.

    - Direct impacts must not reduce the patch size to less than 0.5 ha OR isolate the patch by more than 50 m to the nearest patch (unless already isolated by more than 50 m).

    - Patches >1.0 ha must not be dissected in a way that creates one patch <0.5 ha.

- Siting of full sized well pads will aim to avoid moderate constraint areas to the greatest extent practical. However, if full sized well pads are required within a moderate constraint area (even if only partially within), a 'minimal disturbance' approach will be utilised (i.e. topsoil strip for purpose of site levelling, but avoidance of importation of fill or significant compaction).

- When siting Project infrastructure within a wider low constraint area that contains patches of moderate constraint, existing breaks between patches will be utilised to minimise increases in habitat fragmentation.

- Where impacts on a moderate constraint area are unavoidable, Project infrastructure that is linear (i.e. gathering lines, tracks etc) should be sited in a way that impacts patch edges only. Where this is not achievable, within linear patches and particularly those on drainage lines, the siting should dissect the patch at a perpendicular angle and preferably intersect at the patches narrowest part to minimise clearing.

- Where potential impacts within a moderate constraint area are identified, right of way (RoW) widths will be reduced to 8 m, or the smallest width possible for safe construction. Within low constraint areas, RoW widths may be 15 m or more.

- In consultation with the relevant stakeholders, proposed Project infrastructure will be co-located to the greatest extent possible with existing infrastructure such as fences, farm or access tracks, or other pipeline corridor.

- Priority will be given to utilising and/or upgrading existing tracks within the Project Area over creating new access tracks. Where upgrades are required in proximity to a constraint area (excluding low), disturbance on either side of the existing track will be limited to the greatest extent practicable to minimise any potential indirect impacts such as dust. Additionally, track upgrades will include improvements to waterway crossings where necessary.

- No direct impacts are permitted to the Dawson River including the associated riparian vegetation. This reflects the maximum disturbance limits of 0.0 ha for several potentially occurring MNES at this location including, but not limited to, the white-throated snapping turtle, Fitzroy River turtle, greater glider (southern and central) and yellow-bellied glider (south-eastern).

- Any directional drilling works will be strictly planned and controlled to ensure no unintended impacts on MNES occur including compromising groundwater, surface water or landform stability and integrity. Where direction drilling is planned to avoid a watercourse and the associated riparian vegetation, the drilling launch and receipt points (and associated area of any land disturbance including clearing) will occur outside the feature's Riparian Protection Zone (RPZ) as defined by the VM Act. The level of protection afforded is dependent on the stream order:

    - RPZ includes 10 m from the defining bank of a stream order 1 or 2 watercourse.

    - RPZ includes 25 m from the defining bank of a stream order 3 or 4 watercourse.

    - RPZ includes 50 m from the defining bank of a stream order 5 or higher watercourse.

Other key management themes and associated measures are detailed below.

8.2.1.1 Biodiversity

- Prior to any significant disturbance to land, a suitably qualified ecologist will assess the proposed infrastructure location (and areas adjacent where permitted) via a field scout to determine presence, or potential presence of MNES habitat and/or key habitat features. The proposed infrastructure location is defined as the maximum spatial extent of Project-related work including equipment laydowns, vegetation clearing and other ground disturbance. Identification of MNES habitat will be in accordance with habitat rules provided in **Appendix C**.

- During the field scouts, any potential animal breeding places will be searched for. If located, details on the relevant species or fauna group will be collected as well as the GPS location. Where there is the potential that an active breeding place will be tampered with as part of Project activities, this will only be done in accordance with an approved low-risk and/or high-risk DESI Species Management Plan (SMP) (depending on the species to be impacted) in accordance with the QLD Nature Conservation (Animals) Regulation 2020.

- Following the completion of each field scout, the ecology assessment report produced will include:

    - Methods (including survey effort) and results of the field scout.

    - An assessment of predicted changes (if any) to habitat functionality, specifically as it relates to koala dispersal habitat (i.e. due to loss of potential dispersal trees) and painted honeyeater foraging and dispersal habitat (i.e. due to loss of mistletoe).

- Predicted direct and indirect impacts to MNES individuals and/or habitat (including habitat located adjacent to proposed impact area) and an assessment of compliance with relevant regulatory conditions.
- Recommendations to maximise the avoidance of MNES.

- Following clearing, the actual extent of direct impacts to MNES will be determined and added to the cumulative disturbance totals to be compared to the approved maximum disturbance limits outlined in the Project's EPBC Act approval. The cumulative disturbance area totals per MNES will be tracked in Westside's GIS to be included in compliance reporting, as required.

- If a threatened flora or fauna species listed under the EPBC Act at the time of the referral decision (30 June 2022) is identified in the proposed infrastructure location during construction activities including vegetation clearing, all works must temporarily cease until the individual (if an animal) leaves the area of its own accord or is relocated by a suitably qualified spotter-catcher. Threatened flora individuals/populations must be completed avoided via micro siting as per the Protocol. Where Project activities are planned within 50 m or less of MNES habitat (including no-go, high and moderate constraint areas), exclusion zones will be demarcated around the MNES habitat to be protected to avoid unauthorised disturbance and access. This will be done with temporary fencing and/or signage as necessary and will be removed at the conclusion of the activity.

- Prior to site entry, all personnel planning to complete work within the Project Area will attend a Westside site induction and be made aware of the sensitive receptors, including but not limited to MNES, that may be present within or near the work area. The site environment officer may provide informal training on the identification of MNES if necessary. Daily toolbox meetings will be held and will include discussion on any recent MNES fauna sightings, to increase vigilance and minimise accidental interactions.

- Prior to site entry, any personnel planning to complete night work or use tracks in proximity to areas confirmed to contain ornamental snake habitat will be briefed on the species by the site environment officer. The briefing should highlight what the species looks like, it's peak activity periods (at night and after rainfall) and the fact that it is venomous. Any sightings of the species should be reported to the site environment office to ensure vigilance is highest in areas of known occupation.

- A suitably qualified fauna spotter-catcher will be present during all Project activities that require ground disturbance or clearing in MNES habitat, with the exception of areas mapped exclusively as koala dispersal habitat and/or squatter pigeon (southern) dispersal habitat. A spotter-catcher is considered unnecessary in these specific areas of habitat noting the linear nature of the infrastructure location and the low chances an individual will be present given such habitat is generally widely available. If any information becomes available to suggest recent occupation of the area (i.e. recent sighting), a spotter-catcher will be required.

- If present, terrestrial habitat features (tree hollows, potential dens, surface rocks and fallen logs) will be inspected by the fauna spotter-catcher prior to any significant disturbance using work platforms, inspection cameras, or other methods deemed safe and suitable. Habitat features/trees will be marked using appropriate paint or flagging tape.

- Immediately prior to any clearing of MNES habitat, the fauna spotter-catcher will mark larger, discrete and movable microhabitat features such as coarse woody debris and fallen logs for relocation to adjacent or nearby areas of undisturbed suitable habitat, where safe to do so. Translocation of small items may occur by hand, while larger items will be moved using excavators or other machinery under the direct supervision of the fauna spotter-catcher and may be stockpiled first. It is acknowledged that not all microhabitat or all types of microhabitat (i.e. litter and soil cracks) will be able to be relocated.

- Outside of public areas, vehicle movement within the Project Area will be via approved access tracks only with speed limits imposed (40 km/hr on private property). The requirement to enter and traverse the Project Area will be minimised and limited to those required for essential Project activities. Changes to speed limits and access will be promptly communicated to all site personnel via email notifications, toolbox talks and notices in common areas.

- Topsoil will be managed in a manner that preserves its biological and chemical properties (condition E2 of the Project's EA), as per the IECA Best Practice Erosion and Sediment Control document. Topsoil collected as part of site establishment activities will be used during the rehabilitation phase in accordance with the Westside Rehabilitation Management Plan (WCL-0000-HS-PLN-011).

- Construction and maintenance of linear infrastructure must be conducted in accordance with the following preference: when no water is present, in times of no flow, in times of flow but in a way that does not impede low flow. Construction works will be prioritised during the dry season, to minimise the amount of water present during construction activities.

- Pipeline trenches must be backfilled and topsoils reinstated within three months after pipe laying (condition E6 of the Project's EA). Prior to backfilling, excavations or trenches will be inspected for the presence of fauna, and evidence of burrowing fauna or breeding places. If present, the fauna will be relocated, or the breeding place will be managed in accordance with an approved SMP.

- Infrastructure will be sited in a manner that minimises impacts to natural flow regimes. Backfilled, reinstated and revegetated pipeline trenches and RoWs must be re-profiled to original contours and established drainage lines (condition E8 of the Project's EA).

- Any open excavation will be checked for trapped fauna in the early morning (typically within one hour of dawn or as advised by the fauna spotter catcher) and at the end of each day (within one hour of dusk or as advised by the fauna spotter catcher). If required, fauna will be relocated by a suitably qualified spotter-catcher. Fauna egress such as trench ladders, ramps, sticks, ropes and moist hessian sacks at regular intervals (or similar) will be utilised where trenches or excavations are anticipated to remain open for extended periods. This will help trapped fauna escape and/or survive until removed by a fauna spotter-catcher.

- The open ends of welded pipeline sections will be plugged at the end of each day using 'night caps' or similar to prevent the ingress of fauna.

- On the advice of a suitably qualified ecologist, signage which includes information such as wildlife presence will be installed on private roads and tracks to mitigate potential collisions.

8.2.1.2 Weed, Pest and Disease Management

- The Westside Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) and the Weed Management Procedure (WCL-0000-HS-PRC-034) are currently implemented to manage weed spread and incursion risks and pests within the Project Area. These documents will continue to be implemented across the life of the Project.
- The presence and abundance of weed species listed under the *Biosecurity Act 2014* and/or that are WONS will be identified during ecological field scouts and opportunistically by all personnel accessing the Project Area.
- All personnel accessing the Project Area will be made aware of significant weed species (these may be listed species or ones of key concern to landholders) known to the Project Area via toolbox meetings and notices in the common areas of the site office. The site environment officer may provide informal training on the identification of weed species if necessary.
- Construction activities, including vegetation clearing and soil movement, will work from areas with fewer weed species/smaller infestations towards areas where there is a greater abundance of weeds, where practicable, to minimise potential for spread.
- All equipment and vehicles will be free of organic matter that may contain weed reproductive material and have appropriate weed hygiene declarations prior to arriving on site.
- Any Project equipment sourced from international origins will be subject to State and Commonwealth quarantine protocols.
- The siting of stockpile areas, spills dumps, refuse areas and vehicle parking areas will be within areas already cleared or proposed to be cleared to minimise feral animal occurrences.
- Rehabilitation of all significantly disturbed land will be done in accordance with the Project's EA and Rehabilitation Management Plan (WCL-0000-HS-PLN-011). Rehabilitation includes the use of native groundcover species wherever landholder seed mix is not requested.
- Ongoing, routine monitoring will be implemented throughout the life of the Project to ensure early detection of new areas of weed, pathogen and pest spread or incursion, identify previously unrecorded invasive species, and assess the efficacy of prescribed control measures. Specifications of the type and frequency of monitoring are defined in the Biosecurity Management Plan (WCL-0000-HS-PLN-010-010).
- Pest populations across the Project Area and surrounds are likely high given the developed nature of the landscape, including mining, urban and agricultural areas. Nonetheless, feral animal control programs will be conducted by a suitably qualified contractor, as required and in consultation with the relevant landholders.

8.2.1.3 Other Indirect Measures

- Land that has been significantly disturbed by the authorised resource activities must be managed to ensure that mass movement, gully erosion, rill erosion, sheet erosion and tunnel erosion do not occur on that land (condition E3 of the Project's EA).
- All Project activities will preferentially be completed during daylight hours.

- Night works or vehicle movements within or adjacent to areas of MNES will for the most part be avoided. Where night works are required, lights will be directed to minimise light spill into adjacent habitats.

- Dust suppression measures will be implemented as required i.e. on high wind days (winds above 20 km/hr) during dry periods. The frequency and intensity of produced water used for dust suppression will be managed in accordance with the Produced Water Management Plan (MSG-GN00-HS-PLN-002).

- Speed limits will be imposed throughout the Project Area, informed by appropriate signage as required. Should Westside personnel or contractors fail to comply with speed limits, this will be recorded and corrective action taken as deemed appropriate by the site supervisor.

- Internal roads will be maintained so that natural drainage patterns and catchments retain their pre-disturbance flow regime.

- Noise-related impacts on sensitive receivers as a result of Project activities (including blasting) will be managed via the Noise Management Plan (WCL-0000-HS-PLN-009). Noise limits specific to time periods are included which are consistent with the Project's EA. Although measures are specific to minimising impacts on people, it is likely these will also benefit fauna including listed threatened and/or migratory species.

- Noise mitigation measures will be implemented during noise-generating Project activities, such as drilling campaigns, in accordance with the Noise Management Plan (WCL-0000-HS-PLN-009).

- Erosion and sediment control devices will be implemented in accordance with IECA Best Practice Erosion and Sediment Control documents during construction to minimise the risk of potential sedimentation to sensitive receptors including areas of MNES habitat. Relevant measures may be captured in the Project's EMP or a dedicated plan.

- Construction of linear infrastructure requiring a watercourse crossing will be undertaken in accordance with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* under the *Fisheries Act 1994* and *Planning Act 2016.*

- Beneficial use of produced water in accordance with the water quality limits under the Project's EA and beneficial use approvals under the *Waste Reduction and Recycling Act 2011* (e.g. ANZECC water quality limits for irrigation).

- Chemicals and fuels stored, must be effectively contained and where relevant, meet Australian Standards, where such a standard is applicable (condition E4 of the Project's EA).

- The use, transport and disposal of chemicals, fuels and other pollutants will be carefully considered and strictly controlled via Project management plans including the EMP. Contingencies are in place to ensure any accidental release or spill is immediately detected and managed, with corrective actions taken immediately.

8.2.2 MNES-specific Mitigation Measures

Mitigation and management measures specific to the known and potentially occurring MNES within the Project Area are detailed in **Table 8.2** below.

Key threatening processes to each MNES are detailed in the made/adopted National Recovery Plans, SPRAT database, Approved Conservation or Conservation Listings. These documents have been reviewed to ensure the mitigation measures are appropriate and relevant.

Westside supports the full range of domestic measures Australia has adopted for improved conservation and tighter restrictions on trade of CITES listed species. The Project does not involve international trade in wildlife and no Project activities would facilitate such trade.

Table 8.2 MNES-Specific Measures

Relevant MNES	Measures	Cumulative Maximum Disturbance Limit
Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC	• TECs within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of TECs within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential TEC mapped). • No direct impacts to Coolibah TEC or Poplar Box Woodland TEC will be permissible at any time throughout the life of the Project. • Direct impacts to Brigalow TEC will occur on the edges of patches only, and/or utilise existing gaps and breaks. No patches will be dissected, however where existing gaps are already present these may be widened, provided cumulative maximum disturbance limits for the TEC are adhered to and patch viability commitments are not violated (refer **Section 8.2.1**). • No stockpiling of construction materials including excavated soil will occur in areas identified as TEC. • Clearing works will maintain a vegetation 'buffer zone' of 5 m or more around areas of TEC to ensure suitable micro-climatic conditions are maintained and weed incursion risks are reduced. • The extent of Project-related construction work (including equipment laydown and other non-clearing activities) proposed to occur within 5 m of a confirmed or potential TEC will be demarcated using flagging tape, barricade webbing or similar, to avoid accidental clearing outside the approved disturbance area. • Confirmed and potential TEC areas adjacent to Project construction activities will be inspected by a suitably qualified ecologist prior to commencement and at completion of works, in accordance with the methods outlined in the Project SSMP (MSG-GN00-HS-PLN-005). • All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species. • Wherever landholder seed mix is not requested, rehabilitation works in areas adjacent to a TEC will prioritise the use of native species, to reduce further incursion of weed species and/or exotic grass species (i.e. buffel grass) within the area. Rehabilitation will be undertaken in accordance with the Westside Rehabilitation Management Plan (WCL-0000-HS-PLN-011).	0.9 ha
Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions TEC		0.0 ha
Poplar Box Grassy Woodland on Alluvial Plains TEC		0.0 ha

Relevant MNES	Measures	Cumulative Maximum Disturbance Limit
Xerothamnella herbacea ***Solanum dissectum*** ***Solanum johnsonianum***	• Threatened flora individuals/populations and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of threatened flora populations and habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped). • No direct impacts to any threatened flora plants listed under the EPBC Act will be permissible at any time throughout the life of the Project. Areas known to support threatened flora listed under the EPBC Act adjacent to Project construction activities will be monitored by a suitably qualified ecologist in accordance with the frequency and method provided in the Project SSMP (MSG-GN00-HS-PLN-005). • Where a plant is identified to potentially be a species' listed under the EPBC Act, but formal identification cannot be made at the time of surveying, the plants will be assumed to be the threatened species and managed accordingly until proper identification occurs. • Direct impacts to potential habitat for the relevant threatened flora species (i.e. meets the habitat definition but did not contain any individuals or populations) are only permitted to a cumulative maximum disturbance limit of 1.0 ha. Direct impacts to potential threatened flora habitat will be avoided to the maximum extent possible. • The extent of Project-related construction work (including equipment laydown and other non-clearing activities) proposed to occur within 5 m of threatened flora habitat will be demarcated using flagging tape, barricade webbing or similar, to avoid accidental clearing outside the approved disturbance area. • The siting of Project infrastructure will aim to minimise fragmentation of potential habitat as much as possible (i.e. clear edges rather than dissect patches) to maintain core patch and population viability. • No stockpiling of construction materials including excavated soil will occur in areas identified as threatened flora habitat. • A vegetation 'buffer zone' of 5 m or more will be established around identified locations of threatened flora species to ensure suitable micro-climatic conditions are maintained and weed incursion risks are reduced. The known threatened flora location, inclusive of the buffer zone, will be considered a 'no-go' zone to mitigate any occurrence of accidental damage or death as a result of trampling etc. Given the very small size of the plants (forbs) and root system characteristics (*Xerothamnella herbacea* able to root at the nodes that contact the soil while both *Solanum* spp. rhizomatous and may benefit from some disturbance), a 5 m buffer is considered sufficient.	1.0 ha potential habitat / 0 confirmed individuals

Relevant MNES	Measures	Cumulative Maximum Disturbance Limit
	• Patches confirmed to contain threatened flora individuals/populations and associated 'no-go' zones, adjacent to Project construction activities will be inspected by a suitably qualified ecologist prior to commencement and at completion of works, to ensure no unintentional indirect impacts have occurred in accordance with the methods outlined in the Project SSMP (MSG-GN00-HS-PLN-005). • In the unlikely event that threatened flora plant listed under the EPBC Act is damaged, removed or killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days. • All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat. • Wherever landholder seed mix is not requested, rehabilitation works in areas adjacent to threatened flora habitat will prioritise the use of native species, to reduce increased incursion of weed species and/or exotic grass species (i.e. buffel grass) within the area. Rehabilitation will be undertaken in accordance with the Westside Rehabilitation Management Plan (WCL-0000-HS-PLN-011).	
Squatter pigeon (southern) (*Geophaps scripta scripta*)	• Squatter pigeon (southern) and Australian painted snipe individuals, nests and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. Nest locations should be recorded and mapped. The presence and extent of squatter pigeon (southern) and Australian painted snipe habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped). • Direct impacts to squatter pigeon (southern) breeding habitat and foraging habitat are permitted only to a cumulative maximum disturbance limit of 1.0 ha. Direct impacts to squatter pigeon (southern) dispersal habitat are permitted only to a cumulative maximum disturbance limit of 40.0 ha. Direct impacts to potential squatter pigeon (southern) habitat will be avoided to the maximum extent possible. • Direct impacts to Australian painted snipe seasonal breeding, foraging and dispersal habitat are permitted only to a cumulative maximum disturbance limit of 6.0 ha. Direct impacts to potential Australian painted snipe habitat will be avoided to the maximum extent possible. • Where clearing is proposed within squatter pigeon (southern) dispersal habitat, micro-siting efforts will aim to retain mature trees that may provide shelter from aerial predators. • Where clearing is proposed for areas of squatter pigeon (southern) (breeding and foraging habitat only) or Australian painted snipe habitat (all utilisation categories), a fauna spotter-catcher must be present.	1.0 ha breeding habitat 1.0 ha foraging habitat 40.0 ha dispersal habitat
Australian painted snipe (*Rostratula australis*)		6.0 ha seasonal breeding, foraging and dispersal

Relevant MNES	Measures	Cumulative Maximum Disturbance Limit

	• Immediately prior to clearing any squatter pigeon (southern) or Australian painted snipe habitat, the fauna spotter-catcher will complete flushing transects to encourage the movement of individuals out of the impact area.
	• As both the squatter pigeon (southern) and Australian painted snipe nests on the ground and is at high risk of direct mortality, potential nests should also be searched for by the fauna spotter-catcher immediately prior to clearing potential habitat, with any located demarcated.
	  ○ If a squatter pigeon (southern) nest is located and the area is not already identified as breeding habitat, work will temporarily cease. The Protocol will identify the next steps, including but not limited to, re-categorised the area as breeding habitat and determining if predicted impact areas are within the cumulative disturbance limits for squatter pigeon (southern) breeding habitat.
	  ○ If direct disturbance to a squatter pigeon (southern) or Australian painted snipe nest is required, this will be managed under an approved DESI SMP (high-risk). A minimum 100 m radius exclusion zone (or larger if determined necessary by the fauna spotter-catcher) will be required around active nests.
	• To reduce the potential for crushing of nests or direct mortality, all vehicles and pedestrians will remain within designated access tracks in areas of squatter pigeon (southern) and Australian painted snipe habitat.
	• To minimise the chances of collision, in known squatter pigeon (southern) and Australian painted snipe occurrence areas on private property, speed limits will be reduced to 40 km/hr or less and signage will be installed that indicates subspecies presence. It is noted that both species are currently considered a potential occurrence and are not known to the Project Area.
	• In the unlikely event that a squatter pigeon (southern) or Australian painted snipe is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days.
	• Clearing in and around potential squatter pigeon (southern) and Australian painted snipe water sources (i.e. farm dams and wetlands) will be preferentially avoided. Where clearing is proposed within or adjacent to Australian painted snipe habitat or a squatter pigeon (southern) water source, active erosion and sediment control measures will be implemented to mitigate potential habitat degradation.
	• Water extraction activities at any potentially suitable water source for squatter pigeon (southern) or Australian painted snipe will be strictly controlled and monitored to ensure the continuation of the resource. Per waterbody, a single access point will be utilised for water extraction to minimise areas of disturbance and allow potentially occurring individuals to avoid the same area during construction.	

Relevant MNES	Measures	Cumulative Maximum Disturbance Limit
	• All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.	

Ornamental snake (*Denisonia maculata*)	• Ornamental snake individuals and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of ornamental snake habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped).
	• Direct impacts to ornamental snake suitable habitat is permitted only to a cumulative maximum disturbance limit of 16.0 ha. Direct impacts to potential ornamental snake habitat will be avoided to the maximum extent possible.
	• Where clearing is proposed for areas of ornamental snake suitable habitat, a fauna spotter-catcher must be present. The fauna spotter-catcher will attempt to relocate any ornamental snake individuals that may occur within areas of potential habitat to be cleared to nearby areas of suitable habitat to be retained. This will be done by:
	  ○ Searching for individuals via spotlighting surveys at night. This could be completed the night before works are planned, or at any time within three months of clearing works if conditions are suitable i.e. following rain.
	  ○ Searching for individuals immediately prior to clearing within surface microhabitat such as fallen timber and deep litter piles.
	  ○ Any ornamental snakes captured will be relocated at least 100 m away. The chances of relocated ornamental snake/s returning to areas of habitat to be cleared are considered low as radio tracking studies completed by Veary, (2011) indicate that the species moves only short distances during late summer and winter, and even shorter distances in summer. The species was tracked by Veary (2011) and found to move a total of 54 m from the point of release during a 5-month period.
	• Where clearing is proposed within or adjacent to ornamental snake suitable habitat, active erosion and sediment control measures will be implemented to mitigate potential habitat degradation.
	• The period of time that trenches and other excavations are open will be minimised, particularly in areas where the species has been recorded and in mapped suitable habitat.
		16.0 ha suitable habitat

Relevant MNES	Measures	Cumulative Maximum Disturbance Limit
	• Surface water pipelines design will consider the dispersal requirements of the ornamental snake and be preferentially collocated with access tracks (new or existing) to minimise creating barriers to movement. Where the pipeline is not raised off the ground, egress points that allow ornamental snakes to safely move over or under the pipelines, will be installed (minimum frequency of 1 egress point per 100 m of pipeline). • To reduce the potential for direct mortality, all vehicles and pedestrians will remain within designated access tracks in areas of ornamental snake habitat. • To minimise the chances of collision, in known ornamental snake occurrence areas within the Project Area, speed limits will be reduced to 40 km/hr or less and signage will be installed that indicates species presence. • Larger, discrete surface microhabitat features such as fallen timber and surface rocks will be relocated to adjacent areas of undisturbed habitat prior to clearing, where safe to do so. As described in **Section 8.2.1**, the fauna spotter-catcher will identify these items prior to clearing and relocation will be supported by machinery as required. • If an ornamental snake is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days. • All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.	
Koala (*Phascolarctos cinereus*)	• Koala individuals and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of koala habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped). • No direct impacts to koala habitat categorised as climate refugia will be permissible at any time throughout the life of the Project. • As the majority of the Project Area is mapped as some form of koala habitat (primarily dispersal habitat comprising non-remnant vegetation), direct impacts on the species habitat are largely unavoidable. Siting of infrastructure will preferentially retain breeding and foraging habitat (which contains key habitat resources and may fulfil lifecycle requirements) over shelter and dispersal habitat.	0.0 ha climate refugia 2.0 ha breeding and foraging 6.9 ha shelter 400.0 ha dispersal only

Relevant MNES	Measures	Cumulative Maximum Disturbance Limit

	• Direct impacts to koala breeding and foraging habitat are permitted only to a cumulative maximum disturbance limit of 2.0 ha. Direct impacts to koala shelter habitat and dispersal habitat are permitted only to a cumulative maximum disturbance limit of 6.9 ha and 400.0 ha respectively. Of the 400 ha limit for dispersal habitat, 1% (or 4 ha) may comprise koala dispersal trees measured by canopy cover.
	• During the field scouts, the presence and extent (measured by canopy cover) of koala dispersal trees (recognised as a plant of any genera that has a tree diameter that is equal to or greater than 10 cm when measured at 1.3 m above the ground (referred as >10 cm DBH)) within areas of koala dispersal habitat with be assessed as part of habitat verification and mapping. This data will be used to provide guidance on micro-siting and inform the site-specific determination of impacts to dispersal habitat (including area of dispersal tree cover loss predicted). The subsequent field scout ecology report will detail the findings and include an assessment of predicted residual changes to koala dispersal capacity as a result of the Project, relative to the baseline. No functional loss of koala dispersal habitat will be permitted.
	• The micro-siting of Project infrastructure within areas of koala dispersal habitat proposed for clearing will prioritise the retention of koala dispersal trees (highest priority) followed by any native woody vegetation.
	• Within areas of koala breeding and foraging habitat to be cleared, micro-siting will aim to maximise the retention of Brigalow Belt Locally important koala trees, as defined in *A review of koala habitat assessment criteria and methods* (Youngentob, Marsh and Skewes, 2021).
	• Within areas of koala shelter habitat to be cleared, micro-siting will aim to maximise the retention of Brigalow Belt ancillary koala trees, as defined in *A review of koala habitat assessment criteria and methods* (Youngentob, Marsh and Skewes, 2021).
	• Clearing must be carried out in a way that ensures any koala present have time to move out of the clearing site without human intervention.
	• Where clearing is proposed for areas of koala habitat (breeding and foraging and shelter habitat categories), a fauna spotter-catcher must be present. Prior to vegetation clearing commencing, the fauna spotter-catcher will include canopy searches for koalas. If a koala is located during clearing activities:
	  ○ The individual must not be forcibly relocated.
	  ○ Any tree which houses a koala as well as any tree with a crown that overlaps that tree will not be cleared until the koala vacates the tree on its own volition.
	  ○ Allow a clearing buffer surrounding the tree, equal to the height of the tree or deemed suitable by the fauna spotter-catcher.
	  ○ Any injured koala (and fauna in general) should be transported to a vet or recognised wildlife carer.	

Relevant MNES	Measures	Cumulative Maximum Disturbance Limit
	• Requirements for koalas subject to handling to be examined and if suspected of Chlamydia infection will be taken to a predesignated veterinarian/wildlife care facility for treatment prior to release. • To reduce the potential for direct mortality, all vehicles and pedestrians will remain within designated access tracks in areas of koala habitat. • To minimise the chances of collision, in known koala occurrence areas, speed limits (in private areas) will be reduced to 40 km/hr or less and signage will be installed that indicates species presence. It is noted that the species is currently considered a potential occurrence and is not known to the Project Area. • If a koala is sighted within the Project Area, the details of this observation will be communicated via the daily toolbox and on notices in the common areas of the site office in order to increase vigilance in the area and compliance with enforced speed limits. • In the unlikely event that a koala is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days. • All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.	
Greater glider (southern and central) (*Petauroides volans*)	• No direct impacts are permitted to greater glider (southern and central) denning habitat (maximum disturbance limit of 0.0 ha). • Direct impacts to greater glider (southern and central) foraging and dispersal habitat are permitted to a cumulative maximum disturbance limit of 2.0 ha. • When clearing greater glider (southern and central) foraging and dispersal habitat, micro-siting will aim to retain the tallest trees present within the assessed area, to ensure availability of gliding launch points is retained. • During the field scouts, ecologists will assess tree height and size relative to known glide angle to determine if an area meets the habitat definition and how habitat exists functionally in the landscape (i.e. as an isolated patch or as a habitat corridor). This data will also be used to determine if proposed infrastructure siting is in accordance with the below measure that specifies that clearing must not create gaps within a habitat corridor that are impassable.	0.0 ha denning 2.0 ha foraging and dispersal

Relevant MNES	Measures	Cumulative Maximum Disturbance Limit
	• Where clearing is proposed within a greater glider (southern and central) habitat corridor, as defined in the MNES habitat criteria, field scout data collected by a qualified ecologist will be used to understand how much wider existing gaps can be made. Clearing required for construction of the Project will not create gaps in the habitat corridor that are too great for the species to glide across based on known glide ratios (i.e. turn the corridor into two isolated patches or corridors, thereby reducing habitat connectivity within the Project Area).	

Painted honeyeater (*Grantiella picta*)	• Painted honeyeater individuals and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of painted honeyeater habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped).
	• During the field scouts, the diversity and abundance of mistletoe within areas of suitable habitat must be assessed and mapped. This data will inform the assessment by field scouts, regarding the impacts to foraging and dispersal habitat, and specifically any potential changes in habitat functionality. No loss of habitat functionality per patch will be permitted, as determined by a suitably qualified ecologist. This can be measured by:
	  ○ Reduction in relative abundance: A loss of habitat functionality may occur in areas assessed using relative abundance, where there is a change in mistletoe abundance from rare to absent. Depending on the context, a reduction from abundant mistletoe to occasional mistletoe may not impact functionality.
	  ○ Reduction in individual plants with mistletoe: In areas assessed where individual plants have been mapped, any reduction >10% may impact functionality.
	• Direct impacts to painted honeyeater habitat are permitted only to a cumulative maximum disturbance limit of 6.9 ha. Direct impacts to potential painted honeyeater habitat will be avoided to the maximum extent possible.
	• Within areas of painted honeyeater foraging and dispersal habitat that are proposed for clearing, micro-siting will preferentially retain trees containing the species preferred mistletoe, which are from the genus *Amyema*.
	• Where clearing is proposed for areas of painted honeyeater habitat, a fauna spotter-catcher must be present.
	• Immediately prior to clearing any painted honeyeater habitat, the fauna spotter-catcher will complete canopy searches to identify any foraging individuals. The movements of any identified individuals should be monitored during the completion of clearing works to ensure they relocate of their own volition.
		6.9 ha breeding, foraging and dispersal

Relevant MNES	Measures	Cumulative Maximum Disturbance Limit
	• In the unlikely event that a painted honeyeater is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days. • All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.	
Yellow-bellied glider (south-eastern) (*Petaurus australis australis*) **Yakka skink (*Egernia rugosa*)** **Boggomoss snail (*Adclarkia dawsonensis*)** **Fitzroy River turtle (*Rheodytes leukops*)** **White-throated snapping turtle (*Elseya albagula*)**	• Threatened fauna individuals and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of threatened fauna habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped). • All areas of potential habitat (excluding Boggomoss snail) will be designated a high constraint area (i.e. only incidental surveys with no ground disturbance permitted) and no direct impacts as a result of the Project will occur (i.e. disturbance limit of 0.0 ha). • Boggomoss snail habitat that is confirmed via a field scout will become a no-go constraint area, to minimise mortality risks including accidental trampling. • In the unlikely event that a fauna species listed threatened under the EPBC Act is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days. • All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat. • Measures outlined in the Westside Noise Management Plan (WCL-0000-HS-PLN-009), Erosion and Sediment Control Procedure (WCL-0000-HS-PRC-029) and Weed Management Procedure (WCL-0000-HS-PRC-034) will be implemented to minimise indirect impacts to the species. • Project activities that utilise chemicals, fuels and other pollutants will be carefully planned for and follow strict industry-standard protocols. Specific consideration will be given to the location of sensitive environmental values present in the vicinity, especially 'no-go' and high constraint areas, and the potential for contamination. Contingencies will be in place to ensure any accidental release or spill is immediately detected and managed, with corrective actions taken immediately. Measures relating to chemicals, fuels and other pollutants outlined in the EMP will be implemented to ensure potential indirect impacts on the species and its habitat are managed effectively.	0.0 ha

9.0 Significant Impact Assessments

Significant impact assessments for the threatened species and communities determined to be 'known' or having a 'high' or 'moderate' likelihood to occur are provided below. These assessments were updated in 2024 to consider the new cumulative disturbance limits (**Table 7.1**) as well as any new or revised guidance documents (i.e. Conservation Advice) issued post referral. The assessments have been completed in accordance with the *Significant Impact Guidelines 1.1* (Department of the Environment, 2013b). A PMST was also re-run in October 2024 to ensure all MNES identified as potentially occurring within the Project Area (refer to **Section 4.2** and **Section 5.0**) were considered. Further information regarding each values distribution and habitat requirements, threats, occurrence and potential habitat within the Project Area is also provided.

As noted in **Section 7.1.1**, migratory species are not a controlling provision for the Project as per the referral decision dated 30 June 2022. As such, no disturbance limits have been set and revised significant impact assessments have not been completed.

A summary of the relevant MNES, species habitat presence within the Project Area, direct impact limits and significant impact assessment outcome is provided in **Table 9.1**.

Table 9.1 Summary of Significant Impact Assessment Outcomes

MNES	Habitat Categories	Habitat within Project Area (ha)	Cumulative Maximum Disturbance Limit (ha / no. of individuals)	Cumulative Maximum Habitat Loss (%)	SIA Outcome
Brigalow TEC	-	988.8	0.9	0.09	**Not significant**
Coolibah TEC	-	105.1	0.0	0.0	**Not significant**
Poplar Box TEC	-	705.0			
Xerothamnella herbacea	-	1,076.8	1.0 ha potential habitat / 0 confirmed individuals	0.09	**Not significant**
Solanum dissectum	-				
Solanum johnsonianum	-				
Squatter pigeon (southern)	Breeding	1577.2	1.0	0.06	**Not significant**
	Foraging	44.6	1.0	2.2	
	Dispersal	3,055.0	40.0	1.3	
Ornamental snake	Suitable habitat	4,849.2	16.0	0.33	**Potentially significant**
Koala	Climate refugia	948.6	0.0	0.0	**Potentially significant**
	Breeding and foraging	801.0	2.0	0.25	
	Shelter	800.3	6.9	0.86	
	Dispersal	16,297.0	400.0	2.45	**Not significant**

MNES	Habitat Categories	Habitat within Project Area (ha)	Cumulative Maximum Disturbance Limit (ha / no. of individuals)	Cumulative Maximum Habitat Loss (%)	SIA Outcome
Painted honeyeater	Breeding, foraging and dispersal	2,555.4	6.9	0.27	**Not significant**
Australian painted snipe	Seasonal breeding, foraging and dispersal	1,354.7	6.0	0.4	**Not significant**
Greater glider (southern and central)	Denning	1,187.1	0.0	0.0	**Not significant**
	Foraging and dispersal	-	2.0	-	**Not significant**
White-throated snapping turtle	Breeding, foraging and dispersal	523.9	0.0	0.0	**Not significant**
Fitzroy River turtle	Breeding, foraging and dispersal				
White-throated needletail	Foraging and dispersal	2,1002.1	No limit[8]	NA	**Not significant**
Yellow-bellied glider (south-eastern)	Denning, foraging and dispersal	1,039.4	0.0	0.0	**Not significant**
Yakka skink	Breeding, foraging and dispersal	2,205.9	0.0	0.0	**Not significant**
Boggomoss snail	Breeding, foraging and dispersal	159.0	0.0	0.0	**Not significant**

9.1 Brigalow TEC

9.1.1 Status under the EPBC Act

The Brigalow TEC is listed as Endangered under the EPBC Act.

9.1.2 Distribution and Habitat Requirement

The Brigalow TEC occurs in semi-arid eastern New South Wales (NSW) and QLD, predominantly west of the Great Dividing Range (Department of the Environment, 2013a). The TEC reaches as far north as Townsville in QLD and as far south as Narrabri in NSW. In QLD it is found in a number of bioregions including the Brigalow Belt bioregion.

[8] This species is a non-breeding migrant to Australia and is mostly aerial, foraging on the wing and moving with weather systems. Based on the species ecology, no clearing limit has been applied.

This ecological community is characterised by *Acacia harpophylla* (brigalow) as one of the dominant species in the tree layer. The species may also be co-dominant (most commonly *Casuarina cristata* (belah), but in some circumstances with Myrtaceous species). The community ranges in composition and structure however is typically represented by a combination of a number of species which are associated with acidic and salty clay soils.

As described in **Section 6.1.6**, brigalow is considered predominantly shallow-rooted. Vegetation communities that are solely reliant on shallow soil moisture are not terrestrial GDEs. Further, no DCCEEW-endorsed guidance on the TEC including the Conservation Advice, Listing Advice and SPRAT, provides any indication that the community may be groundwater dependent.

In QLD, the Brigalow TEC is defined using the RE framework, where a number of REs are considered analogous with the TEC provided that other key diagnostic criteria and condition thresholds are met. Key diagnostic criteria and condition thresholds are outlined in the Approved Conservation Advice (Department of the Environment, 2013a).

As described in the communities Approved Conservation Advice (Department of the Environment, 2013), there are several additional considerations that should be taken into account when applying the key diagnostic characteristics and condition thresholds. Judgement of whether an EPBC-protected ecological community is present at a particular site should focus on how an area meets the description, particularly the key diagnostic characteristics for the national ecological community.

9.1.3 Threats

As detailed by SPRAT, key threats to the Brigalow TEC have been identified as those which may lead to further reduction in extent, cause a decline in condition or impede its recovery. The most important current threats are clearing, fire, plant and animal pests and lack of knowledge.

The listing of this community was a result of extensive clearing. The community has been modified at a landscape scale with clearing resulting in significant fragmentation and reduction in patch size (Department of the Environment, 2013a). Clearing for resource extraction and illegal logging are an ongoing threat to the community. Weed invasion and overgrazing by native fauna are both promoted by the high levels of fragmentation.

9.1.4 Occurrence and Potential Habitat

A total of 988.8 ha of Brigalow TEC is mapped within the Project Area including 117.4 ha validated during previous field surveys analogous to REs 11.3.1, 11.4.8 and 11.4.9. Brigalow TEC has been confirmed at 33 locations across the Project Area by Umwelt in 2019, 2023 and 2024. There are eight REs analogous with this TEC mapped within the Project Area, six of which have been ground-truthed during field surveys. One additional analogous RE (11.9.1) has not yet been subject to field verification however is identified as present as per the State RE mapping.

Patch sizes of confirmed Brigalow TEC vary from 0.61 ha to 26.65 ha. Remnant and regrowth vegetation consistent with this TEC is generally sparsely distributed throughout the Project Area, with patches generally small and isolated amongst cleared non-remnant paddocks. However, larger contiguous patches do exist, particularly along roadways such as Theodore Moura Road and in association with the major watercourse Kianga Creek. The condition of this TEC varied across the Project Area, with large remnant patches limited in the landscape but generally of highest quality.

Predicted Brigalow TEC within the Project Area comprises 988.8 ha and is based on the Project's refined vegetation mapping of polygons containing REs 11.3.1, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.9a, 11.9.1 and 11.9.5. Field validated Brigalow TEC includes vegetation in both remnant and regrowth condition, and as such mapped Brigalow TEC also includes areas of HVR.

Given the broad nature of the mapping rules and the inability to evaluate condition thresholds at a desktop level, it is likely that the true extent of Brigalow TEC within the Project Area is lower than that currently predicted. Many regrowth brigalow patches exist throughout the Project Area that do not meet key condition thresholds to be considered the TEC as per the findings of the field survey program. Generally, these patches did not meet TEC status because total exotic cover exceeded native vegetative cover (all layers combined) and/or patch size was not more than 0.5 ha (Department of the Environment, 2013a). Non-compliant brigalow patches typically comprise open canopies and a dense ground layer of exotic pasture grasses. Given the similar land use and level of disturbance across the properties not field-validated, it is possible that other areas of mapped potential Brigalow TEC may not meet TEC status.

In unsurveyed parts of the Project Area, vegetation containing an analogous RE with this TEC was conservatively mapped to contain the TEC. Mapped TEC within the Project Area also includes State mapped heterogenous polygons; although the full extent of these areas has been included, they may only partially contain an analogous RE, they may contain a different RE altogether, or the RE may be dominated by a different tree species and therefore the diagnostic criteria for the TEC may not be met.

The extent of mapped Brigalow TEC is provided below in **Table 9.2**, and the mapped habitat is shown on **Figure 9.1**.

Table 9.2 Predicted Extent of Brigalow TEC

Mapped Type	Habitat Definition	Extent within the Project Area (ha)
Known	Patches confirmed via field assessment by a qualified ecologist to be the Brigalow ecological community as described in the Approved Conservation Advice (Department of the Environment, 2013a).	117.4
Potential	The Brigalow ecological community is characterised by the presence of Brigalow (*Acacia harpophylla*) as one of the three most abundant tree species. Brigalow is usually either dominant in the tree layer or co-dominant with other species such as *Casuarina cristata* (Belah), other species of Acacia, or species of Eucalyptus. The ecological community has a considerable range of vegetation structure and composition united by a suite of species that tend to occur on acidic and salty clay soils.	871.4
	Total	**988.8**

9.1.5 Habitat Critical to the Survival of the TEC

Areas considered critical to the survival of the Brigalow TEC includes all patches that meet the key diagnostic characteristics and condition thresholds for the ecological community; as well as the buffer zones (areas directly adjacent to the community), particularly where these include native vegetation (Department of the Environment, 2013a).

All mapped areas of Brigalow TEC within the Project Area are conservatively considered to comprise critical habitat.

9.1.6 Potential Project Impacts and Key Mitigation Measures

All areas of potential Brigalow TEC will be field validated prior to disturbance. Over the life of the Project, Westside have committed to a cumulative maximum disturbance of 0.9 ha of Brigalow TEC.
Potential indirect impacts on Brigalow TEC as a result of the Project includes:

- increased edge effects
- further weed and pest incursion
- temporary periods of elevated dust, leading to potential declines in vegetation health.

General mitigation measures are outlined in **Section 8.2.1.** Mitigation measures specific to the Brigalow TEC are outlined in **Section 8.2.2** and below:

- TECs within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of TECs within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential TEC mapped).
- Direct impacts to Brigalow TEC will occur on the edges of patches only, and/or utilise existing gaps and breaks. No patches will be bisected or dissected, however where existing gaps are already present these may be widened, provided cumulative maximum disturbance limits for the TEC are adhered to and patch viability commitments are not violated (refer **Section 8.2.1**).
- No stockpiling of construction materials including excavated soil will occur in areas identified as TEC.
- Clearing works will maintain a vegetation ‘buffer zone’ of 5 m or more around areas of TEC to ensure suitable micro-climatic conditions are maintained and weed incursion risks are reduced.
- The extent of Project-related construction work (including equipment laydown and other non-clearing activities) proposed to occur within 5 m of a confirmed or potential TEC will be demarcated using flagging tape, barricade webbing or similar, to avoid accidental clearing outside the approved disturbance area.
- Confirmed and potential TEC areas adjacent to Project construction activities will be inspected by a suitably qualified ecologist prior to commencement and at completion of works, in accordance with the methods outlined in the Project SSMP (MSG-GN00-HS-PLN-005).

- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species.
- Wherever landholder seed mix is not requested, rehabilitation works in areas adjacent to a TEC will prioritise the use of native species, to reduce further incursion of weed species and/or exotic grass species (i.e. buffel grass) within the area. Rehabilitation will be undertaken in accordance with the Westside Rehabilitation Management Plan (WCL-0000-HS-PLN-011).

9.1.7 Significant Impact Assessment

The significant impact assessment for the TEC is presented in **Table 9.3** below. In summary, the assessment found that the Project is **unlikely to result in a significant impact on the Brigalow TEC**.

Table 9.3 Significant Impact Assessment – Brigalow TEC

EPBC Act Criteria – is there a real chance or possibility that the Project will:	Assessment of Significance	Significant Impact?
Reduce the extent of an ecological community?	Brigalow TEC is known to occur within the Project Area, generally comprising narrow and small fragmented patches. A total of 1,234.81 ha of Brigalow TEC is mapped within the Project Area, however the majority of identified areas have not yet been verified. Any site proposed for development will be surveyed first by qualified ecologists to confidently identify Brigalow TEC in accordance with the community's key diagnostic and condition criteria. A maximum disturbance of 0.9 ha will occur within confirmed Brigalow TEC over the life of the Project. Micro-siting of infrastructure will look to retain patch connectivity and maximise the use of existing gaps. It is likely that only the edges of Brigalow TEC patches may need to be cleared, i.e. to widen existing gaps. No patches will be dissected by Project infrastructure, unless existing gaps are already present. Given the extent of historical clearing within the Project Area and ongoing agricultural activities, as well as the generally narrow and small fragmented patches, it is anticipated that all areas of Brigalow TEC present are already impacted by edge effects and somewhat degraded by exotic weeds such as buffel grass (*Cenchrus ciliaris**). Nonetheless, potential indirect impacts on the community such as increased weed incursion will be actively managed via Project management plans including but not limited to the SSMP and the EMP. Rehabilitation works in areas adjacent to a TEC will prioritise the use of native species, to reduce increased incursion of weed species within the area. No stockpiling of construction materials including excavated soil will occur in areas identified as TEC. Based on this, it is considered unlikely the Project will reduce the extent of the ecological community.	Unlikely
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines?	As described above, Brigalow TEC mapped within the Project Area generally already comprises narrow and small patches with reduced connectivity. Nonetheless, to ensure fragmentation does not occur and/or is not increased as a result of the Project, micro-siting of infrastructure will look to retain patch connectivity and maximise the use of existing gaps. It is likely that only the edges of Brigalow TEC patches may need to be cleared, i.e. to widen existing gaps. No patches will be dissected by Project infrastructure unless existing gaps are already present. Therefore, the Project is unlikely to increase fragmentation of the ecological community.	Unlikely

EPBC Act Criteria – is there a real chance or possibility that the Project will:	Assessment of Significance	Significant Impact?
Adversely affect habitat critical to the survival of an ecological community?	All areas of Brigalow TEC within the Project Area are conservatively considered to comprise habitat critical to the survival of the ecological community. The Project is committing to a maximum disturbance of 0.9 ha of Brigalow TEC, which will ensure very little adverse effects on critical habitat. This clearing will be conducted over the life of the Project, and in isolated areas, likely on the edge of patches to widen existing gaps. Mitigation and management measures will limit the scope and severity of any potential indirect impacts on Brigalow TEC as a result of the Project. This includes weed management and erosion and sediment control. No changes to habitat quality are anticipated as a result of the Project with no changes to surface water drainage or grazing pressures predicted. Based on this, adverse impacts to habitat critical to the survival to the TEC are unlikely.	Unlikely
Modify or destroy abiotic (non-living) factors (such as water, nutrients or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns?	Brigalow TEC is known to occur within the Project Area, generally comprising narrow and small fragmented patches. A total of 1,234.81 ha of Brigalow TEC is mapped within the Project Area, however the majority of identified areas have not yet been verified. Any site proposed for development will be surveyed first by qualified ecologists to confidently identify Brigalow TEC in accordance with the community's key diagnostic and condition criteria. A maximum disturbance of 0.9 ha will occur within confirmed Brigalow TEC over the life of the Project. Micro-siting of infrastructure will look to retain patch connectivity and maximise the use of existing gaps. It is likely that only the edges of Brigalow TEC patches may need to be cleared, i.e. to widen existing gaps. No patches will be dissected by Project infrastructure unless existing gaps are already present. Mitigation and management measures will be actively enforced throughout construction to reduce potential indirect impacts such as erosion and sedimentation, spread of weeds and dust. Rehabilitation works in areas adjacent to a TEC will prioritise the use of native species, to reduce increased incursion of weed species within the area. No stockpiling of construction materials including excavated soil will occur in areas identified as TEC. The Project will not alter the flow of water along drainage lines where some Brigalow TEC occurs or impact on groundwater levels to the extent that vegetation dieback may occur. Furthermore, there is no evidence to suggest this ecological community is reliant on groundwater. As such, it is considered unlikely the Project will modify or destroy abiotic factors necessary for the survival of Brigalow TEC.	Unlikely
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?	Indirect impacts will be actively managed via Project management plans. No changes to species composition are anticipated as any existing pressures on the community will remain unchanged (i.e. weeds, pests and edge effects). The Project does not involve regular burning or flora or fauna harvesting.	Unlikely

EPBC Act Criteria – is there a real chance or possibility that the Project will:	Assessment of Significance	Significant Impact?
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: **Assisting invasive species, that are harmful to the listed ecological community, to become established; or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community?**	No changes to the quality or integrity of Brigalow TEC within the Project Area will occur as a result of Project activities. As described above, it is anticipated that all areas of Brigalow TEC present are already impacted by edge effects based on the narrow and small fragmented patches present, with invasive pasture grasses such as buffel grass (*Cenchrus ciliaris**) known to occur throughout the Project Area. Furthermore, due to the prevalence of anthropogenic disturbance including agricultural practices across the Project Area, invasive species including feral pests and livestock species are likely to be common. No changes to existing grazing pressures are anticipated. Nonetheless, potential indirect impacts on the community such as increased disturbance, weed and pest incursion will be actively managed via Project management plans including but not limited to the SSMP, EMP and Westside Weed Management Procedure. These plans also include mitigation and management measures relevant to the storage of chemicals and erosion and sediment control. Many known locations of Brigalow TEC are close to existing operations including narrow road reserves and windrows. Where Project activities are proposed in areas adjacent to the community there is an increased risk of indirect impacts on the community. Rehabilitation works in areas adjacent to a TEC will prioritise the use of native species, to reduce increased incursion of weed species within the area. Any weed spraying following rehabilitation will comprise a targeted spot application by suitably qualified and experienced operators, to minimise the accidental death of native species. No stockpiling of construction materials including excavated soil will occur in areas identified as TEC to ensure no accidental smothering of native ground-cover plants. Based on the above, it is considered highly unlikely the Project will cause a substantial reduction in the quality or integrity of an ecology community.	Unlikely
Interfere with the recovery of an ecological community?	There is currently no recovery plan for the Brigalow TEC, however the Approved Conservation Advice does list priority conservation actions including research and monitoring priorities and threat reduction/control. Project activities will not interfere with or hinder such actions. The Project will not interfere with the recovery of Brigalow TEC as limited direct impacts are proposed (maximum 0.9 ha), and indirect impacts will be actively managed via Project management plans.	Unlikely

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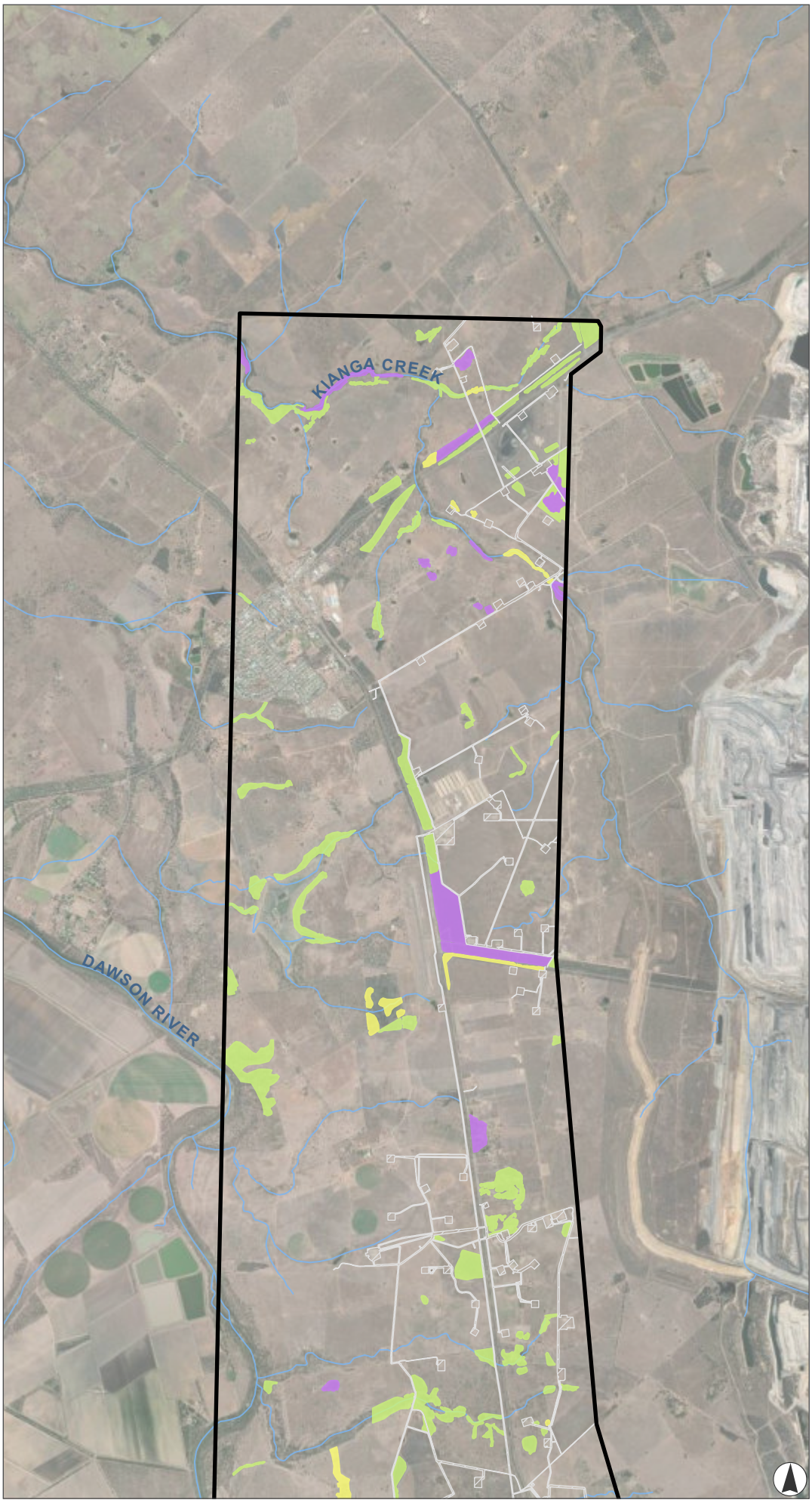


FIGURE 9.1A

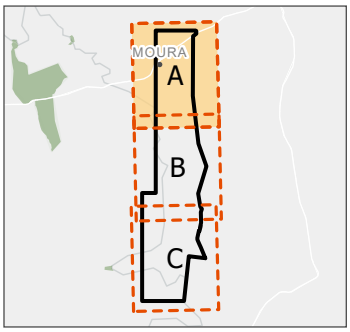
Brigalow TEC Habitat Map

Legend

- Watercourse
- Project Area
- Existing Westside infrastructure

Brigalow TEC Habitat

- Analogous RE but not TEC
- Confirmed
- Potential



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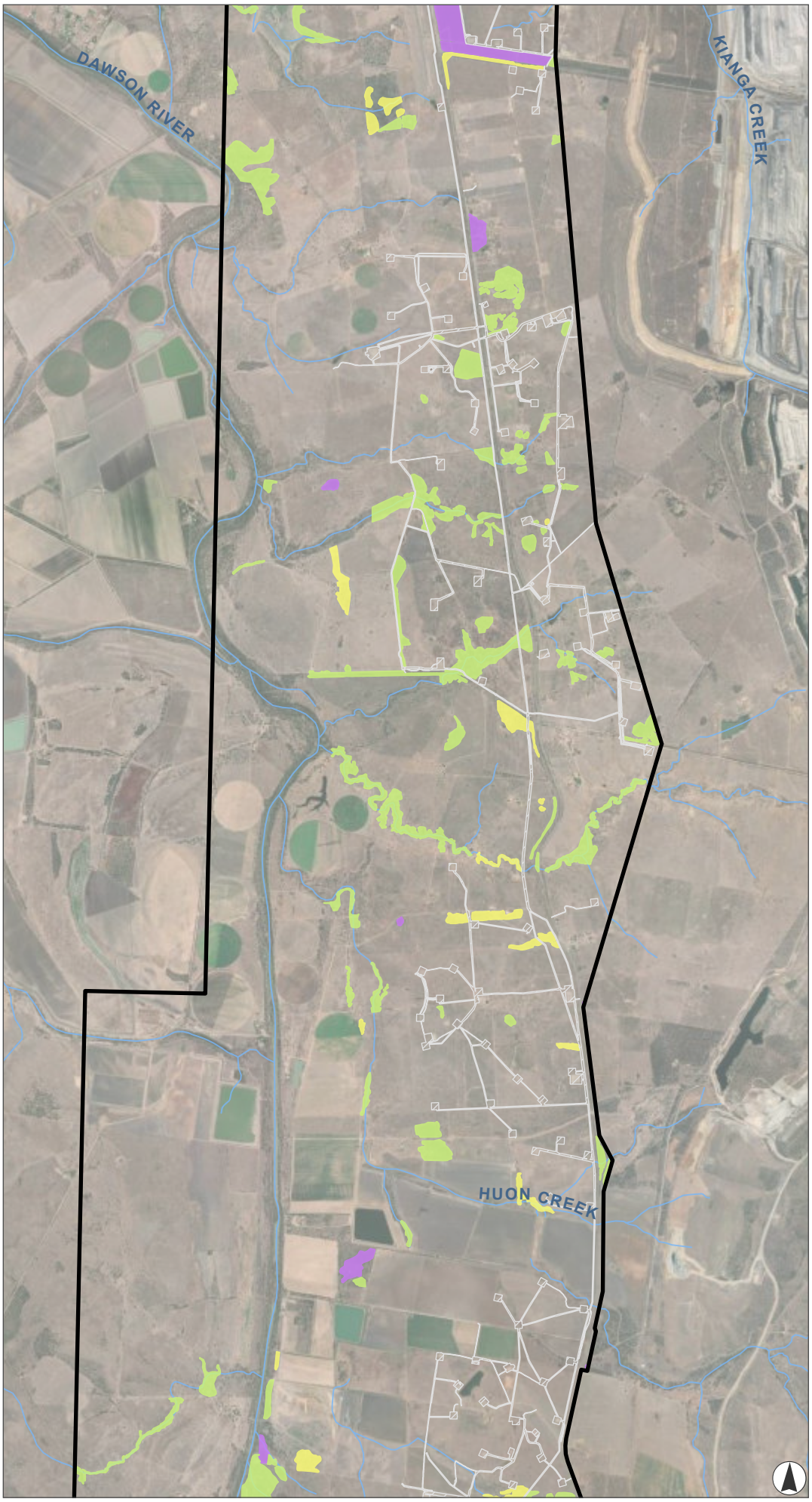

FIGURE 9.1B

Brigalow TEC Habitat Map

Legend

- Watercourse
- Project Area
- Existing Westside infrastructure

Brigalow TEC Habitat

- Analogous RE but not TEC
- Confirmed
- Potential

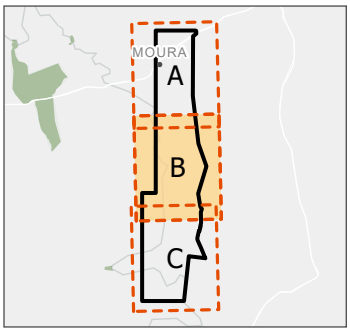

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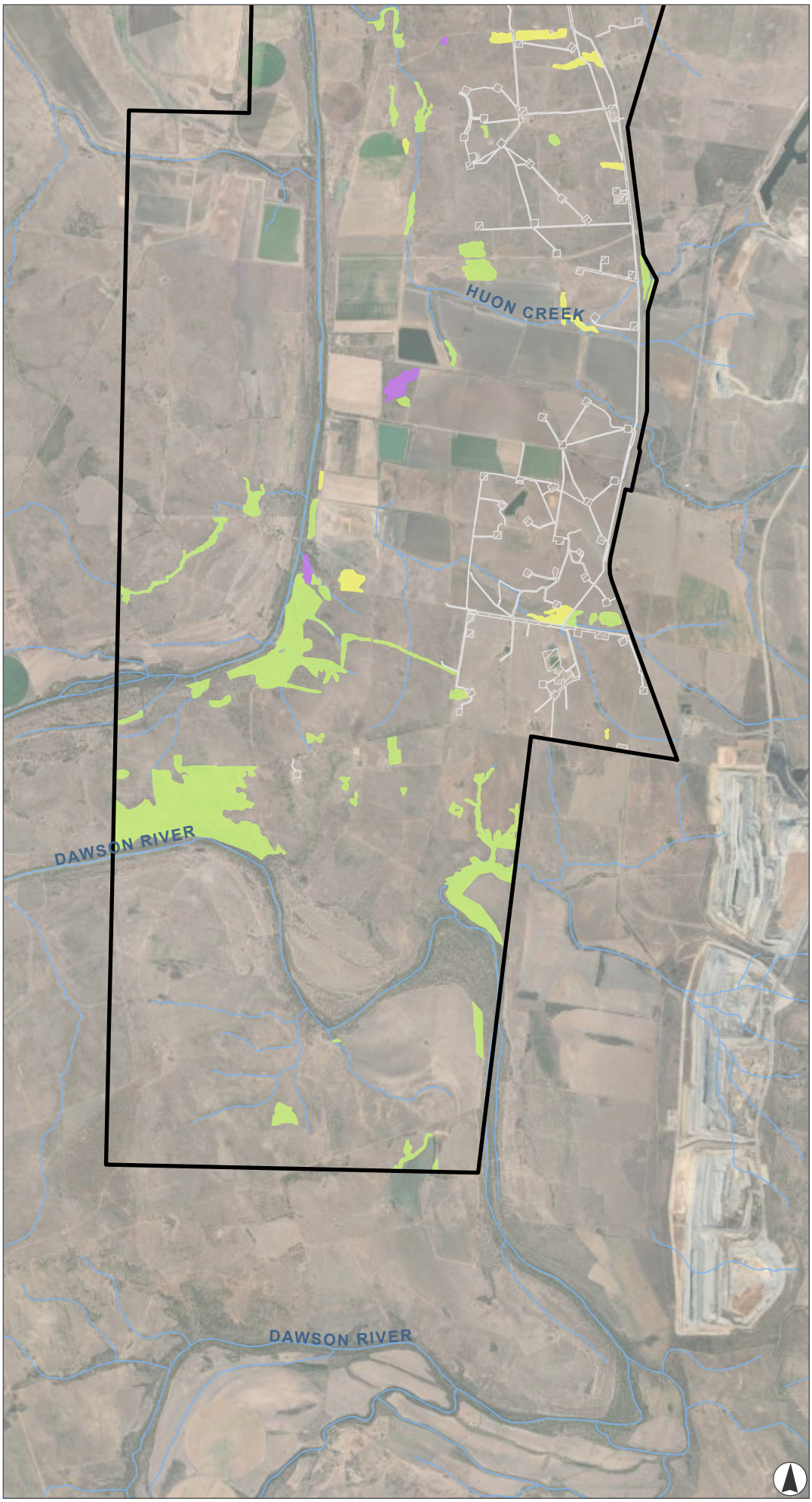
FIGURE 9.1C

Brigalow TEC Habitat Map

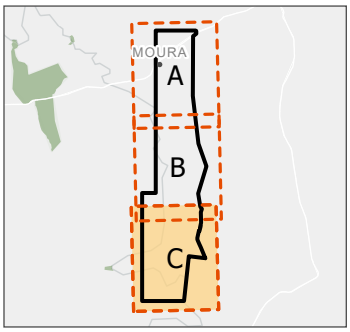


Legend

- Watercourse
- Project Area
- Existing Westside infrastructure

Brigalow TEC Habitat

- Analogous RE but not TEC
- Confirmed
- Potential



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9.2 Coolibah TEC

9.2.1 Status under the EPBC Act

The Coolibah TEC is listed as Endangered under the EPBC Act.

9.2.2 Distribution and Habitat Requirement

This community occurs on the floodplains and drainage areas of the Darling Riverine Plains and the Brigalow Belt South bioregions, situated in northern NSW and southern QLD (Department of Sustainability Environment Water Populations and Communities, 2011). The southern limit of the ecological community is the southern boundary of the Darling Riverine Plains bioregion in NSW, and the northern limit is the northern boundary of the Brigalow Belt South bioregion in QLD.

It comprises one type of semi-arid to humid subtropical woodland where *Eucalyptus coolabah* subsp. *coolabah* (coolibah) and/or *Eucalyptus largiflorens* (black vox) are the dominant canopy species and where the understorey tends to be grassy (Department of Sustainability Environment Water Populations and Communities, 2011).

In QLD, the following REs form part of or align with the national ecological community: RE 11.3.3, 11.3.15, 11.3.16, 11.3.28 and 11.3.37 (Threatened Species Scientific Committee, 2011). The listed ecological community is limited to patches that meet the description, key diagnostic characteristics and the condition thresholds outlined in the Commonwealth Listing Advice (Threatened Species Scientific Committee, 2011).

The key diagnostic characteristics and condition thresholds are outlined in the communities Listing Advice (Threatened Species Scientific Committee, 2011), as are several additional considerations that should be taken into account when applying the condition thresholds.

While the Coolibah TEC, or certain plant species supported within, may be able to utilise groundwater (see **Section 6.1.6**), the TEC is predominantly characterised as a floodplain vegetation community that has developed in response to wetting and drying cycles influenced by flooding events (i.e. surface water flows and inundation). Fluctuations in river height across the ecological community can be influenced by heavy rainfall in Queensland but also local rainfall and diversion of water for domestic and agricultural purposes (Cullen et al., 2003). It is notable that many trees in the national ecological community died in the severe drought commencing in 2002 (Benson et al., 2006; Benson, 2008) with the community's resilience to such natural disaster events limited by altered natural water flow regimes.

9.2.3 Threats

Key threats to the TEC include clearing and fragmentation, changes to water flows and patterns, inappropriate grazing regimes; invasion by exotic species (especially lippia (*Phyla canescens**) and African boxthorn (*Lycium ferocissimum**), and the low level of protection in reserves (Threatened Species Scientific Committee, 2011).

Potential threats relate to further land clearing and fragmentation, further changes to water flows and patterns associated with river regulation infrastructure and water storage for irrigation, and climate change impacts.

9.2.4 Occurrence and Potential Habitat

A total of 105.1 ha of Coolibah TEC is mapped within the Project Area, associated with RE 11.3.3 identified in the Project's refined vegetation mapping. Of this area, 24.5 ha was validated during previous field surveys and comprised remnant vegetation. Nonetheless, mapped Coolibah TEC includes areas of HVR to ensure the approach is conservative. Across the Project Area, patches of potential Coolibah TEC are generally limited and small in size. Mapped areas largely coincide with the fringes of the Dawson River and Huon Creek.

Coolibah TEC has been confirmed at one broad area within the Project Area. Two discrete patches (9.8 ha and 14.8 ha) occur along or in proximity to the Dawson River on the associated floodplain within the central Project Area. These patches comprised *Eucalyptus coolabah* woodland to open woodland analogous to RE 11.3.3 – *E. coolabah* woodland on alluvial plains. This community exhibited a high degree of disturbance on the floodplain, particularly from parthenium (*Parthenium hysterophorus**), a Weed of National Significance.

Three additional patches of vegetation analogous to Coolibah TEC (RE 11.3.3) have been assessed and found to not meet the condition criteria of the TEC as they were either below the minimum patch size threshold (<5 ha) (one patch), present as regrowth patches where tree canopy present did not contain mature or hollow-bearing trees of the minimum DBH threshold (≥30 cm) or had a ground layer dominated by exotic grass such as *Megathyrsus maximus**.

Given the broad nature of the mapping rules and the inability to evaluate condition thresholds at a desktop level, it is possible that the true extent of Coolibah TEC within the Project Area is lower than that currently predicted. As described above, some areas of RE 11.3.3 assessed during the field surveys were found to not meet TEC status. Given the similar land use and level of disturbance across the properties not field-validated, it is possible that other areas of potential Coolibah TEC will not meet TEC status.

In unsurveyed parts of the Project Area, vegetation containing an analogous RE with this TEC was conservatively mapped to contain the TEC. Mapped TEC within the Project Area also includes State mapped heterogenous polygons; although the full extent of these areas has been included, they may only partially contain an analogous RE, they may contain a different RE altogether, or the RE may be dominated by a different tree species and therefore the diagnostic criteria for the TEC may not be met.

The extent of mapped Coolibah TEC is provided below in **Table 9.4**, and the mapped habitat is shown on **Figure 9.2**.

Table 9.4 Predicted Extent of Coolibah TEC

Mapped Type	Habitat Definition	Extent within the Project Area (ha)
Known	Patches confirmed via field assessment by a qualified ecologist to be the Coolibah ecological community as described in the Listing Advice (Threatened Species Scientific Committee, 2011).	24.5
Potential	The Coolibah ecological community represents occurrences of one type of semi-arid to humid subtropical woodland where *Eucalyptus coolabah* subsp. *coolabah* (coolibah) and/or *Eucalyptus largiflorens* (black box) are the dominant canopy species and where the understorey tends to be grassy.	80.6
	Total	**105.1**

9.2.5 Habitat Critical to the Survival of the TEC

Habitat critical to the survival of the Coolibah TEC is not identified in the communities Listing or Conservation Advice. Given this, the definition of habitat critical specified for the Brigalow TEC has been used as a surrogate: “all patches that meet the key diagnostic characteristics and condition thresholds for the ecological community; as well as the buffer zones (areas directly adjacent to the community), particularly where these include native vegetation (Department of the Environment, 2013a)”.

Applying this definition, all patches of mapped Coolibah TEC are conservatively considered to comprise habitat critical to the survival of the ecological community.

9.2.6 Potential Project Impacts and Key Mitigation Measures

All areas of potential Coolibah TEC will be field validated prior to disturbance. No direct impacts on areas of Coolibah TEC will be permitted at any time throughout the life of the Project. Potential indirect impacts on Coolibah TEC as a result of the Project includes:

- increased edge effects
- further weed and pest incursion
- temporary periods of elevated dust, leading to potential declines in vegetation health.

General mitigation measures are outlined in **Section 8.2.1**. Mitigation measures specific to the Coolibah TEC are outlined in **Section 8.2.2** and below:

- TECs within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of TECs within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential TEC mapped).
- No direct impacts to Coolibah TEC or Poplar Box Woodland TEC will be permissible at any time throughout the life of the Project.
- No stockpiling of construction materials including excavated soil will occur in areas identified as TEC.
- Clearing works will maintain a vegetation ‘buffer zone’ of 5 m or more around areas of TEC to ensure suitable micro-climatic conditions are maintained and weed incursion risks are reduced.
- The extent of Project-related construction work (including equipment laydown and other non-clearing activities) proposed to occur within 5 m of a confirmed or potential TEC will be demarcated using flagging tape, barricade webbing or similar, to avoid accidental clearing outside the approved disturbance area.
- Confirmed and potential TEC areas adjacent to Project construction activities will be inspected by a suitably qualified ecologist prior to commencement and at completion of works, in accordance with the methods outlined in the Project SSMP (MSG-GN00-HS-PLN-005).

- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species.
- Wherever landholder seed mix is not requested, rehabilitation works in areas adjacent to a TEC will prioritise the use of native species, to reduce further incursion of weed species and/or exotic grass species (i.e. buffel grass) within the area. Rehabilitation will be undertaken in accordance with the Westside Rehabilitation Management Plan (WCL-0000-HS-PLN-011).

9.2.7 Significant Impact Assessment

The significant impact assessment for the TEC is present in **Table 9.5** below. In summary, the assessment found that the Project is **unlikely to result in a significant impact on the Coolibah TEC**.

Table 9.5 Significant Impact Assessment – Coolibah TEC

EPBC Act Criteria – is there a real chance or possibility that the Project will:	Assessment of Significance	Significant Impact?
Reduce the extent of an ecological community?	Coolibah TEC is known to occur within the Project Area, generally comprising large, connected patches associated with the Dawson River. A total of 108.15 ha of Coolibah TEC is mapped within the Project Area, however the majority of identified areas have not yet been field-verified. Any site proposed for development will be surveyed first by qualified ecologists to confidently identify Coolibah TEC in accordance with the community's key diagnostic and condition criteria. No direct impacts to Coolibah TEC will occur as a result of the Project. Given the extent of historical clearing within the Project Area and ongoing agricultural activities, it is anticipated that all areas of Coolibah TEC present are already impacted by edge effects and somewhat degraded by exotic weeds such as buffel grass (*Cenchrus ciliaris**) and feral animals such as feral pigs (*Sus scrofa*). Nonetheless, potential indirect impacts on the community such as increased weed incursion will be actively managed via Project management plans including but not limited to the SSMP and the EMP. Rehabilitation works in areas adjacent to a TEC will prioritise the use of native species, to reduce increased incursion of weed species within the area. No stockpiling of construction materials including excavated soil will occur in areas identified as TEC. Based on this, it is considered unlikely the Project will reduce the extent of the ecological community.	Unlikely
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines?	The Project Area contains the township of Moura and is largely dominated by agricultural land uses. As such, patches of Coolibah TEC present are likely to be subject to existing low levels of fragmentation as a result of ancillary infrastructure including roads and transmission lines. Nonetheless, to ensure fragmentation does not occur and/or is not increased as a result of the Project, no direct impacts on Coolibah TEC will be permitted, including for linear infrastructure elements. Project infrastructure may be sited in close proximity to Coolibah TEC; however buffer zones will be maintained wherever possible and care will be taken to manage any potential indirect impacts through the implementation of the SSMP and EMP as well as rehabilitation works.	Unlikely

EPBC Act Criteria – is there a real chance or possibility that the Project will:	Assessment of Significance	Significant Impact?
Adversely affect habitat critical to the survival of an ecological community?	All areas of Coolibah TEC within the Project Area are conservatively considered to comprise habitat critical to the survival of the ecological community. The Project is committing to the complete avoidance of Coolibah TEC, which will ensure no adverse effects on critical habitat. Mitigation and management measures will limit the scope and severity of any potential indirect impacts on Coolibah TEC as a result of the Project. This includes weed management and erosion and sediment control. No changes to habitat quality are anticipated as a result of the Project with no changes to surface water drainage or grazing pressures predicted. Based on this, impacts to habitat critical to the survival to the TEC will be avoided.	Unlikely
Modify or destroy abiotic (non-living) factors (such as water, nutrients or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns?	No direct impacts to Coolibah TEC as a result of the Project will be permitted. The Project will be designed to avoid mapped habitat and instead utilise previously disturbed areas, which will limit impacts to the abiotic factors necessary for the survival of the Coolibah TEC. Mitigation and management measures will be actively enforced throughout construction to reduce potential indirect impacts such as erosion and sedimentation, spread of weeds and dust. Rehabilitation works in areas adjacent to a TEC will prioritise the use of native species, to reduce spread of potential weed species within the area. No stockpiling of construction materials including excavated soil will occur in areas identified as TEC. The Project will not alter surface water flows, including along the Dawson River where the community generally occurs, or significantly impact on groundwater levels. As such, it is considered unlikely the Project will modify or destroy Coolibah TEC.	Unlikely
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?	No direct impacts on Coolibah TEC will occur as a result of the Project and indirect impacts will be actively managed via Project management plans. No changes to species composition are anticipated as any existing pressures on the community will remain unchanged (i.e. weeds, pests and edge effects). The Project does not involve regular burning or flora or fauna harvesting.	Unlikely

EPBC Act Criteria – is there a real chance or possibility that the Project will:	Assessment of Significance	Significant Impact?
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: **Assisting invasive species, that are harmful to the listed ecological community, to become established; or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community?**	No changes to the quality or integrity of Coolibah TEC within the Project Area will occur as a result of Project activities. As described above, it is anticipated that all areas of Coolibah TEC present are already impacted by edge effects, with invasive pasture grasses such as buffel grass (*Cenchrus ciliaris**) known to occur throughout the Project Area. Furthermore, due to the prevalence of anthropogenic disturbance including agricultural practices across the Project Area, invasive species including feral pests and livestock species are likely to be common. No changes to existing grazing pressures are anticipated. Nonetheless, potential indirect impacts on the community such as increased disturbance, weed and pest incursion will be actively managed via Project management plans including but not limited to the SSMP, EMP and Westside Weed Management Procedure. These plans also include mitigation and management measures relevant to the storage of chemicals and erosion and sediment control. Where Project activities are proposed in areas adjacent to the community there is an increased risk of indirect impacts on the community. Rehabilitation works in areas adjacent to a TEC will prioritise the use of native species, to reduce increased incursion of weed species within the area. Any weed spraying following rehabilitation will comprise a targeted spot application, to minimise the accidental death of native species. No stockpiling of construction materials including excavated soil will occur in areas identified as TEC to ensure no accidental smothering of native ground-cover plants. Based on the above, it is considered highly unlikely the Project will cause a substantial reduction in the quality or integrity of an ecology community.	Unlikely
Interfere with the recovery of an ecological community?	There is currently no recovery plan for the Coolibah TEC, however the Listing Advice for the community states that there should be one. It is acknowledged that the recovery of the ecological community is complex, due to the need for a highly adaptive management process and high levels of planning, cross-jurisdictional coordination, co-ordination between managers and support by key stakeholders. The Approved Conservation Advice for the community does outline priority recovery actions. Project activities will not interfere with or hinder such actions. The Project will not interfere with the recovery of Coolibah TEC as avoidance of direct impacts will occur and indirect impacts will be actively managed via Project management plans.	Unlikely

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FIGURE 9.2A

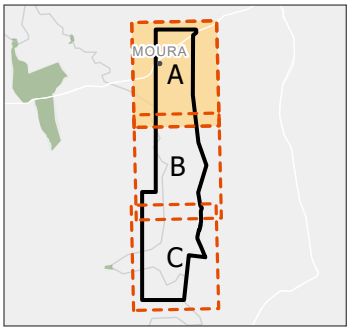
Coolibah TEC Habitat Map

Legend

- Watercourse
- Project Area
- Existing Westside infrastructure

Coolibah TEC Habitat

- Analogous RE but not TEC
- Confirmed
- Potential



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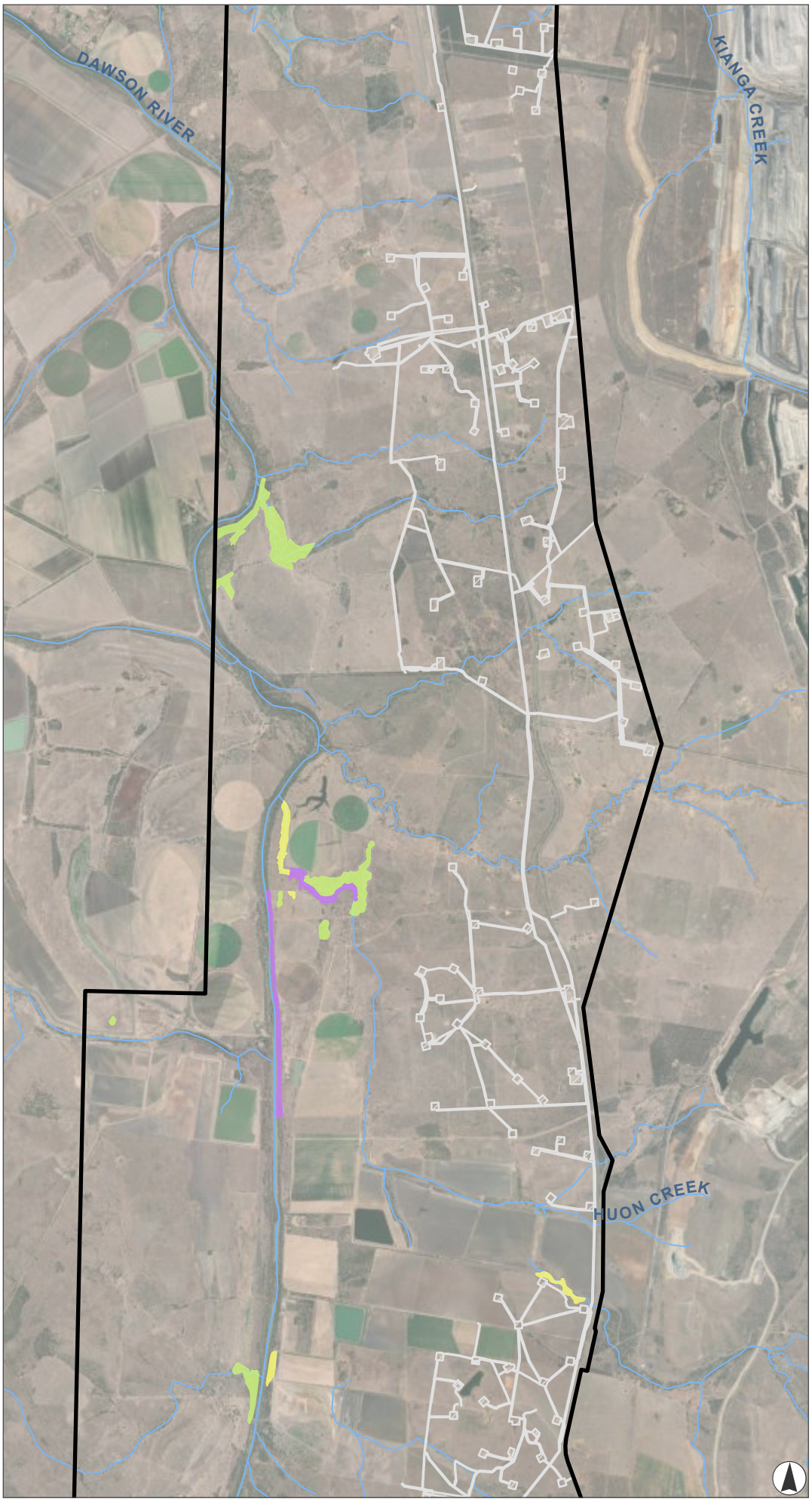

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FIGURE 9.2B

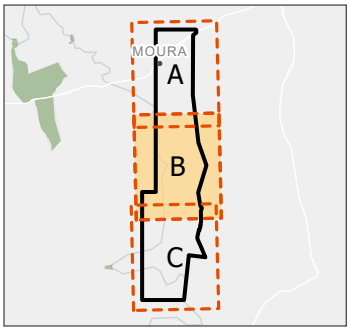
Coolibah TEC Habitat Map

Legend

- Watercourse
- Project Area
- Existing Westside infrastructure

Coolibah TEC Habitat

- Analogous RE but not TEC
- Confirmed
- Potential



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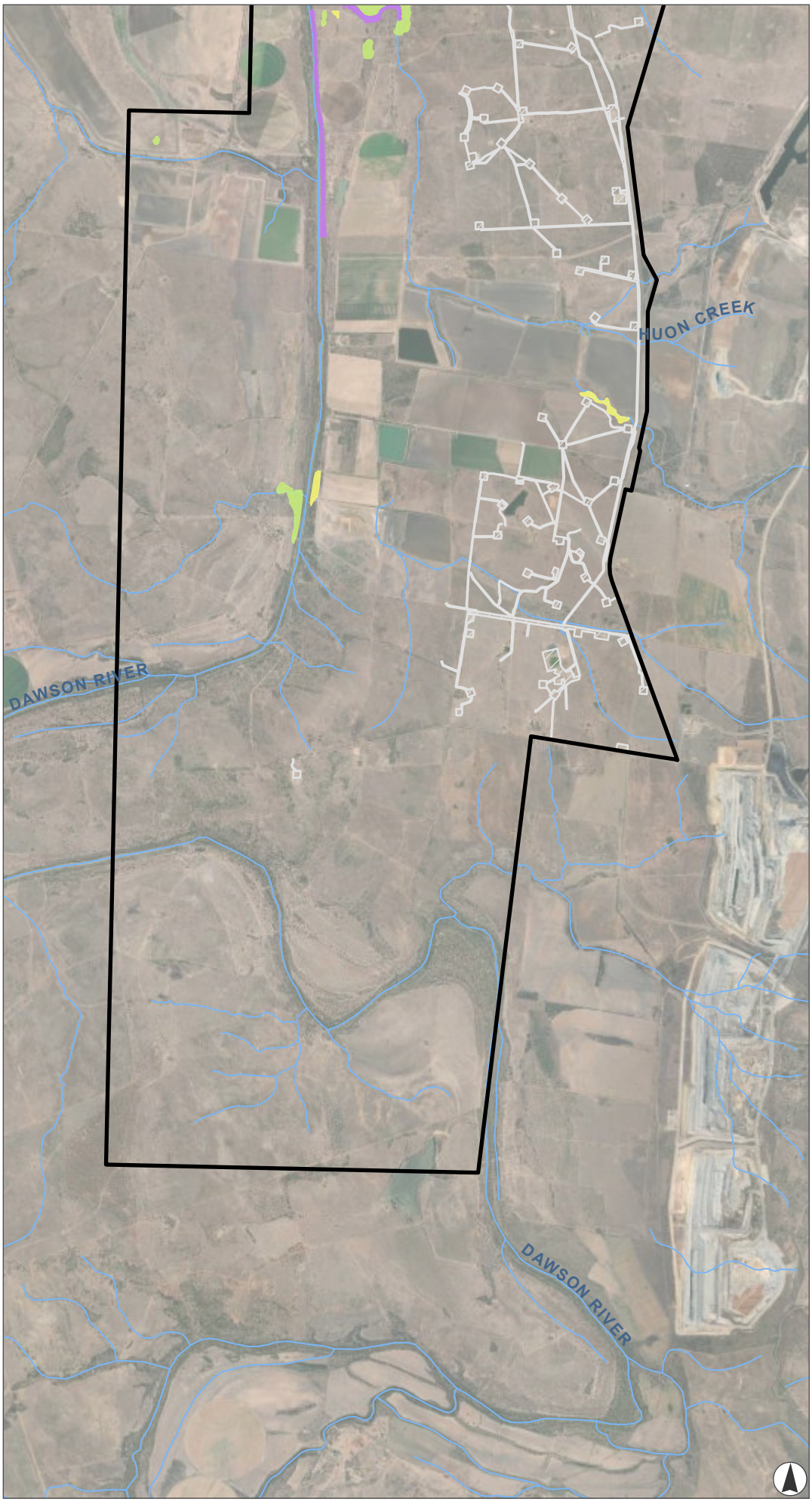


FIGURE 9.2C

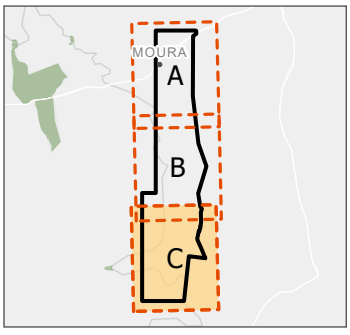
Coolibah TEC Habitat Map

Legend

- Watercourse
- Project Area
- Existing Westside infrastructure

Coolibah TEC Habitat

- Analogous RE but not TEC
- Confirmed
- Potential



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9.3 Poplar Box TEC

9.3.1 Status under the EPBC Act

The Poplar Box TEC is listed as Endangered under the EPBC Act.

9.3.2 Distribution and Description

The Poplar Box TEC occurs in areas west of the Great Dividing Range, typically at less than 300 m above sea level (ASL) and between latitudes 20°S to 34°S (Department of the Environment and Energy, 2019).

The Poplar Box TEC is typically a grassy woodland with a canopy dominated by *Eucalyptus populnea* and understorey mostly of grasses and other herbs. The ecological community mostly occurs in gently undulating to flat landscapes and occasionally on gentle slopes on a wide range of soil types of alluvial and depositional origin. This TEC may include a low density of shrubs, however patches of the ecological community generally lack a substantial mid layer (tall shrub) (Department of the Environment and Energy, 2019).

The listed ecological community is limited to patches that meet the key diagnostic characteristics and condition thresholds outlined in the Conservation Advice (Department of the Environment and Energy, 2019). Key further information, additional factors and critical areas, as described in the communities Conservation Advice (Threatened Species Scientific Committee, 2011), specifically Sections 3.2.3 and Section 3.3, should be taken into consideration.

The Poplar Box TEC, and particularly the canopy trees and ground layer species within, are dependent on surface and groundwater (Department of the Environment and Energy, 2019). The community's Conservation Advice (Department of the Environment and Energy, 2019) details that further research into the hydrological needs of the ecological community are required, including groundwater, surface water flow, impacts from dryland salinity, the legacy effects of water table decline and possible management responses.

9.3.3 Threats

Key threats to the Poplar Box TEC are listed as:

- clearance and fragmentation
- weed invasion
- fire and grazing
- dieback
- chemical impact and spray drift
- hydrological change
- salinisation
- nutrient enrichment

- invasive fauna
- climate change.

9.3.4 Occurrence and Potential Habitat

A total of 705.0 ha of potential Poplar Box TEC is mapped within the Project Area based on the Project's refined vegetation mapping. Poplar Box TEC is considered to have a high likelihood of occurrence within the Project Area due to the presence of analogous REs containing *E. populnea* (REs 11.3.2, 11.3.17, 11.4.12, 11.4.7).

Where assessed, patches have not met TEC status either due to *E. populnea* not dominating the canopy (one area associated with RE 11.4.7) or did not meet condition criteria due to a combination of patch size and ground species composition.

The mapping of this community utilised a conservative approach that assumes presence and it is considered likely that the extent of Poplar Box TEC is over-estimated within the Project Area. Woodlands dominated by *E. populnea* have only been observed infrequently during field surveys within the main Project Area extent, generally as open patches along roadsides. Furthermore, based on field survey data collected to date areas associated with RE 11.4.7 are more likely to be dominated by brigalow than poplar box. However, large portions of the riparian vegetation associated with the Dawson River may comprise RE 11.3.2 as per the State RE mapping. Mapped TEC within the Project Area also includes State mapped heterogenous polygons; although the full extent of these areas has been included, they may only partially contain an analogous RE (or may contain a different RE altogether).

The extent of mapped Poplar Box TEC is provided below in **Table 9.6**, and the areas of mapped Poplar Box TEC within the Project Area are shown on **Figure 9.3**.

Table 9.6 Predicted Extent of Poplar Box TEC

Mapped Type	Habitat Definition	Extent within the Project Area (ha)
Known	Patches confirmed via field assessment by a qualified ecologist to be the Poplar Box ecological community as described in the Conservation Advice (Department of the Environment and Energy, 2019).	0.0
Potential	The Poplar Box ecological community is typically a grassy woodland with a canopy dominated by *Eucalyptus populnea* and understorey mostly of grasses and other herbs. The ecological community mostly occurs in gently undulating to flat landscapes and occasionally on gentle slopes on a wide range of soil types of alluvial and depositional origin.	705.0
	Total	**705.0**

9.3.5 Habitat Critical to the Survival of the TEC

The areas most critical to the survival of the TEC are the best quality, most intact patches of the ecological community. These represent those parts of the ecological community that retain the highest diversity and degree of structure and ecological functions. They represent those sites closest to the original, benchmark states of the ecological community and that must retain their inherent values through protection and ongoing management (Department of the Environment and Energy, 2019).

However, this does not mean that areas that otherwise meet the minimum condition thresholds (i.e. good to moderate condition) are unimportant for the future survival of the ecological community. Many of these sites may contain suites of species or habitat features that are unique or important in a regional or local context. Some of these elements can still be critical to the survival of the Poplar Box TEC (Department of the Environment and Energy, 2019).

Additional areas such as buffer zones around patches, adjoining native vegetation, and areas that meet the description of the ecological community but not the condition thresholds are also important to the survival of the ecological community. They should still be taken into consideration as part of the surrounding environment and landscape context (Department of the Environment and Energy, 2019).

As a conservative estimate, this includes all mapped areas of Poplar Box TEC within the Project Area.

9.3.6 Potential Project Impacts and Key Mitigation Measures

All areas of potential Poplar Box TEC will be field validated prior to disturbance. No direct impacts on areas of Poplar Box TEC will occur. Potential indirect impacts on Poplar Box TEC as a result of the Project includes:

- increased edge effects
- further weed and pest incursion
- temporary periods of elevated dust, leading to potential declines in vegetation health.

General mitigation measures are outlined in **Section 8.2.1**. Mitigation measures specific to the Poplar Box TEC are outlined in **Section 8.2.2** and below:

- TECs within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of TECs within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential TEC mapped).
- No direct impacts to Coolibah TEC or Poplar Box Woodland TEC will be permissible at any time throughout the life of the Project.
- No stockpiling of construction materials including excavated soil will occur in areas identified as TEC.
- Clearing works will maintain a vegetation ‘buffer zone’ of 5 m or more around areas of TEC to ensure suitable micro-climatic conditions are maintained and weed incursion risks are reduced.
- The extent of Project-related construction work (including equipment laydown and other non-clearing activities) proposed to occur within 5 m of a confirmed or potential TEC will be demarcated using flagging tape, barricade webbing or similar, to avoid accidental clearing outside the approved disturbance area.
- Confirmed and potential TEC areas adjacent to Project construction activities will be inspected by a suitably qualified ecologist prior to commencement and at completion of works, in accordance with the methods outlined in the Project SSMP (MSG-GN00-HS-PLN-005).

- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species.
- Wherever landholder seed mix is not requested, rehabilitation works in areas adjacent to a TEC will prioritise the use of native species, to reduce further incursion of weed species and/or exotic grass species (i.e. buffel grass) within the area. Rehabilitation will be undertaken in accordance with the Westside Rehabilitation Management Plan (WCL-0000-HS-PLN-011).

9.3.7 Significant Impact Assessment

The significant impact assessment for the TEC is present in Table 9.7 below. In summary, the assessment found that the Project is **unlikely to result in a significant impact on the Poplar Box TEC.**

Table 9.7 Significant Impact Assessment – Poplar Box TEC

EPBC Act Criteria – is there a real chance or possibility that the Project will:	Assessment of Significance	Significant Impact?
Reduce the extent of an ecological community?	Poplar Box TEC has not been confirmed within the Project Area, however analogous REs are mapped in the Project Area. A total of 734.16 ha of Poplar Box TEC is mapped within the Project Area, however these identified areas have not yet been field-verified. Any site proposed for development will be surveyed first by qualified ecologists to confidently identify Poplar Box TEC in accordance with the community's key diagnostic and condition criteria. No direct impacts to Poplar Box TEC will occur as a result of the Project. Given the extent of historical clearing within the Project Area and ongoing agricultural activities, it is anticipated that all areas of Poplar Box TEC present are already impacted by edge effects and somewhat degraded by exotic weeds such as buffel grass (*Cenchrus ciliaris**) and feral animals such as feral pigs (*Sus scrofa*). Nonetheless, potential indirect impacts on the community such as increased weed incursion will be actively managed via Project management plans including but not limited to the SSMP and the EMP. Rehabilitation works in areas adjacent to a TEC will prioritise the use of native species, to reduce increased incursion of weed species within the area. No stockpiling of construction materials including excavated soil will occur in areas identified as TEC. Based on this, it is considered unlikely the Project will reduce the extent of the ecological community.	Unlikely
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines?	The Project Area contains the township of Moura and is largely dominated by agricultural land uses. As such, patches of Poplar Box TEC present are likely to be subject to existing low levels of fragmentation as a result of the existing land uses and ancillary infrastructure including roads and transmission lines. Nonetheless, to ensure fragmentation does not occur and/or is not increased as a result of the Project, no direct impacts on Poplar Box TEC will be permitted, including for linear infrastructure elements. Project infrastructure may be sited in close proximity to Poplar Box TEC; however buffer zones will be maintained wherever possible and care will be taken to manage any potential indirect impacts. Based on this, it is considered unlikely the Project will fragment or increase fragmentation of the ecological community.	Unlikely

EPBC Act Criteria – is there a real chance or possibility that the Project will:	Assessment of Significance	Significant Impact?
Adversely affect habitat critical to the survival of an ecological community?	All areas of Poplar Box TEC within the Project Area are conservatively considered to comprise habitat critical to the survival of the ecological community. The Project is committing to the complete avoidance of Poplar Box TEC, which will ensure no adverse effects on critical habitat. Mitigation and management measures will limit the scope and severity of any potential indirect impacts on Poplar Box TEC as a result of the Project. This includes weed management and erosion and sediment control. No changes to habitat quality are anticipated as a result of the Project with no changes to surface water drainage or grazing pressures predicted. Based on this, impacts to habitat critical to the survival to the TEC will be avoided.	Unlikely
Modify or destroy abiotic (non-living) factors (such as water, nutrients or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns?	No direct impacts to Poplar Box TEC as a result of the Project will be permitted. The Project will be designed to avoid mapped habitat and instead utilise previously disturbed areas, which will limit impacts to the abiotic factors necessary for the survival of the Poplar Box TEC. Mitigation and management measures will be actively enforced throughout construction to reduce potential indirect impacts such as erosion and sedimentation, spread of weeds and dust. Rehabilitation works in areas adjacent to a TEC will prioritise the use of native species, to reduce spread of potential weed species within the area. No stockpiling of construction materials including excavated soil will occur in areas identified as TEC. The Project will not alter surface water flows, or significantly impact on groundwater levels. As such, it is considered unlikely the Project will modify or destroy Poplar Box TEC.	Unlikely
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?	No direct impacts on Poplar Box TEC will occur as a result of the Project and indirect impacts will be actively managed via Project management plans. No changes to species composition are anticipated as any existing pressures on the community will remain unchanged (i.e. weeds, pests and edge effects). The Project does not involve regular burning or flora or fauna harvesting.	Unlikely

EPBC Act Criteria – is there a real chance or possibility that the Project will:	Assessment of Significance	Significant Impact?
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: **Assisting invasive species, that are harmful to the listed ecological community, to become established; or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community?**	No changes to the quality or integrity of Poplar Box TEC within the Project Area will occur as a result of Project activities. As described above, it is anticipated that all areas of Poplar Box TEC present are already impacted by edge effects, with invasive pasture grasses such as buffel grass (*Cenchrus ciliaris**) known to occur throughout the Project Area. Furthermore, due to the prevalence of anthropogenic disturbance including agricultural practices across the Project Area, invasive species including feral pests and livestock species are likely to be common. No changes to existing grazing pressures are anticipated. Nonetheless, potential indirect impacts on the community such as increased disturbance, weed and pest incursion will be actively managed via Project management plans including but not limited to the SSMP, EMP and Westside Weed Management Procedure. These plans also include mitigation and management measures relevant to the storage of chemicals and erosion and sediment control. Where Project activities are proposed in areas adjacent to the community there is an increased risk of indirect impacts on the community. Rehabilitation works in areas adjacent to a TEC will prioritise the use of native species, to reduce increased incursion of weed species within the area. Any weed spraying following rehabilitation will comprise a targeted spot application, to minimise the accidental death of native species. No stockpiling of construction materials including excavated soil will occur in areas identified as TEC to ensure no accidental smothering of native ground-cover plants. Based on the above, it is considered highly unlikely the Project will cause a substantial reduction in the quality or integrity of an ecology community.	Unlikely
Interfere with the recovery of an ecological community?	The Conservation Advice notes that a national recovery plan for the Poplar Box TEC is not required, because the priority actions listed in the Conservation Advice are sufficient to provide protection from extinction and guidance on the recovery. The priority actions include: protect, restore, communicate/engage with the public, and research and monitoring. The Project will not interfere with the recovery of Poplar Box TEC as avoidance of direct impacts will occur and indirect impacts will be actively managed via Project management plans.	Unlikely

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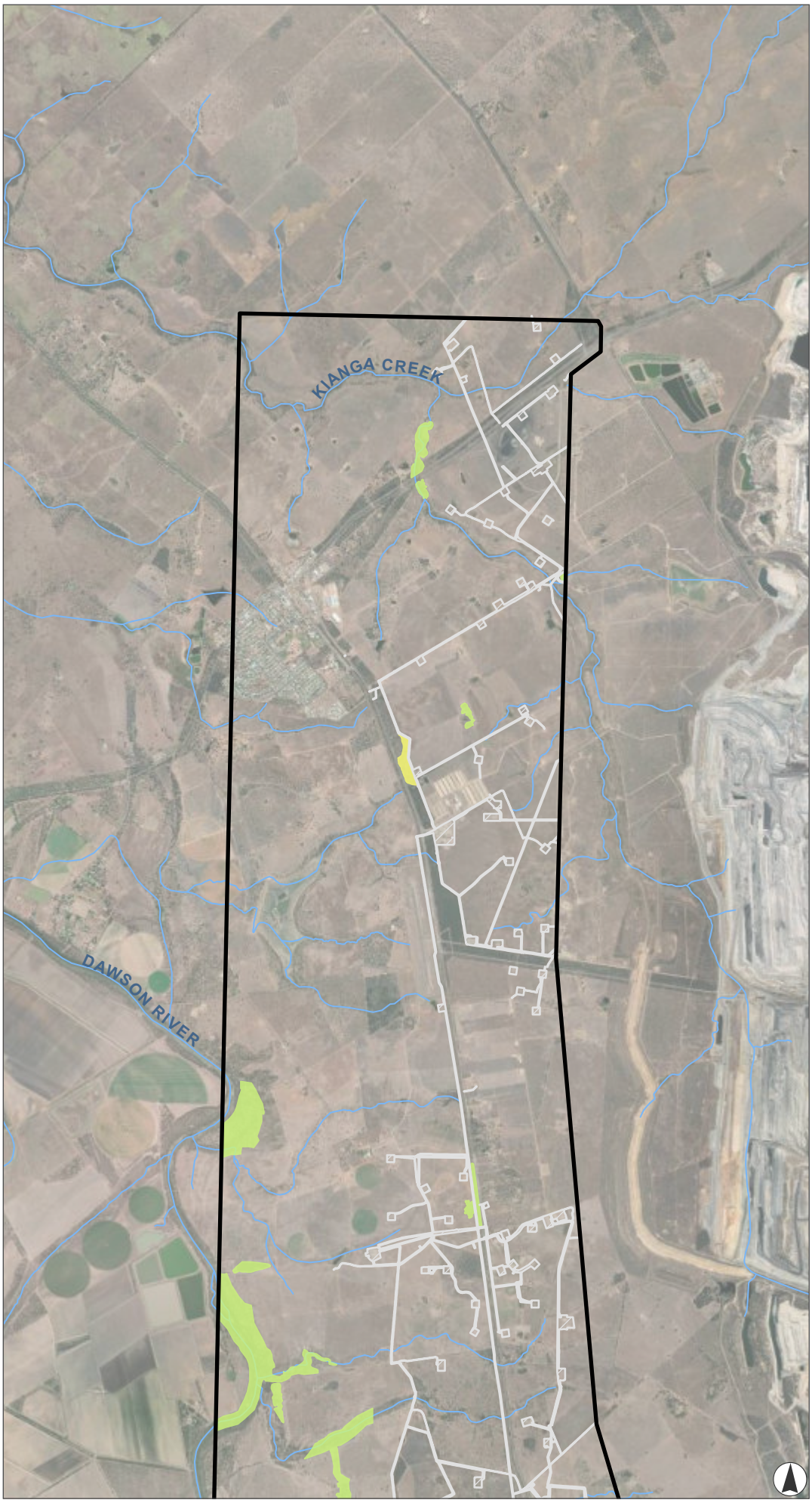


FIGURE 9.3A

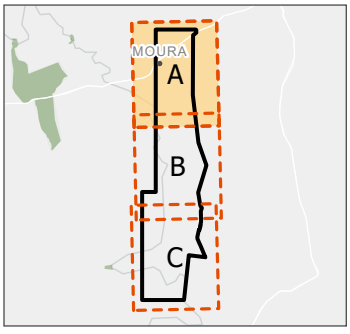
Poplar Box Woodland TEC Habitat Map

Legend

- Watercourse
- Project Area
- Existing Westside infrastructure

Poplar Box Woodland TEC Habitat

- Analogous RE but not TEC
- Potential



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Scale 1:80,000 at A4
GDA2020 MGA Zone 55

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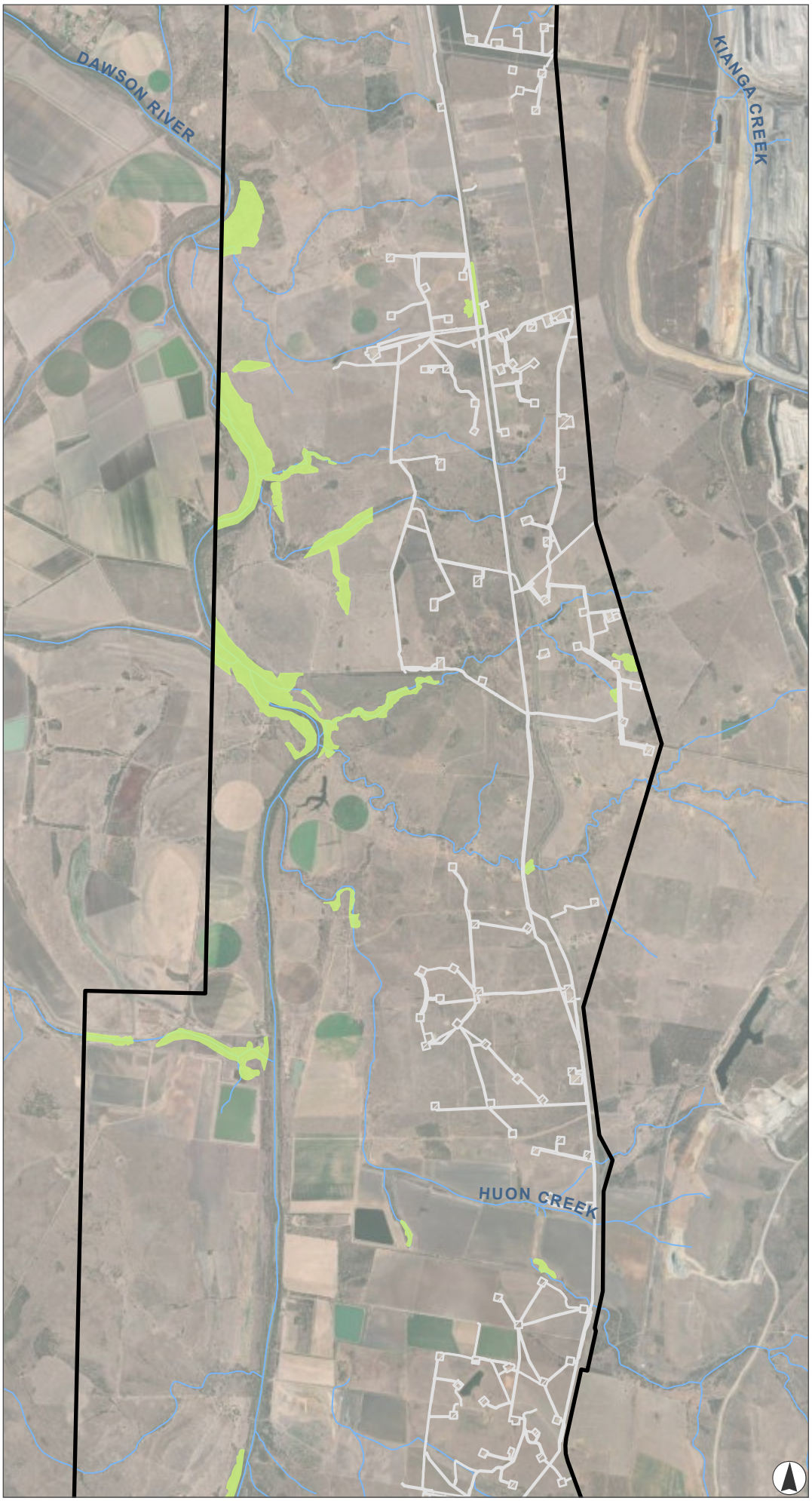


FIGURE 9.3B

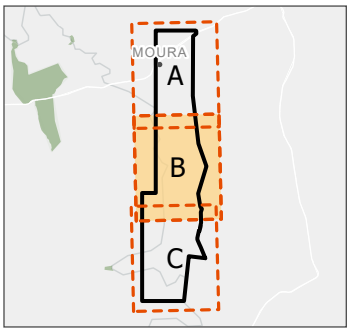
Poplar Box Woodland TEC Habitat Map

Legend

- Watercourse
- Project Area
- Existing Westside infrastructure

Poplar Box Woodland TEC Habitat

- Analogous RE but not TEC
- Potential



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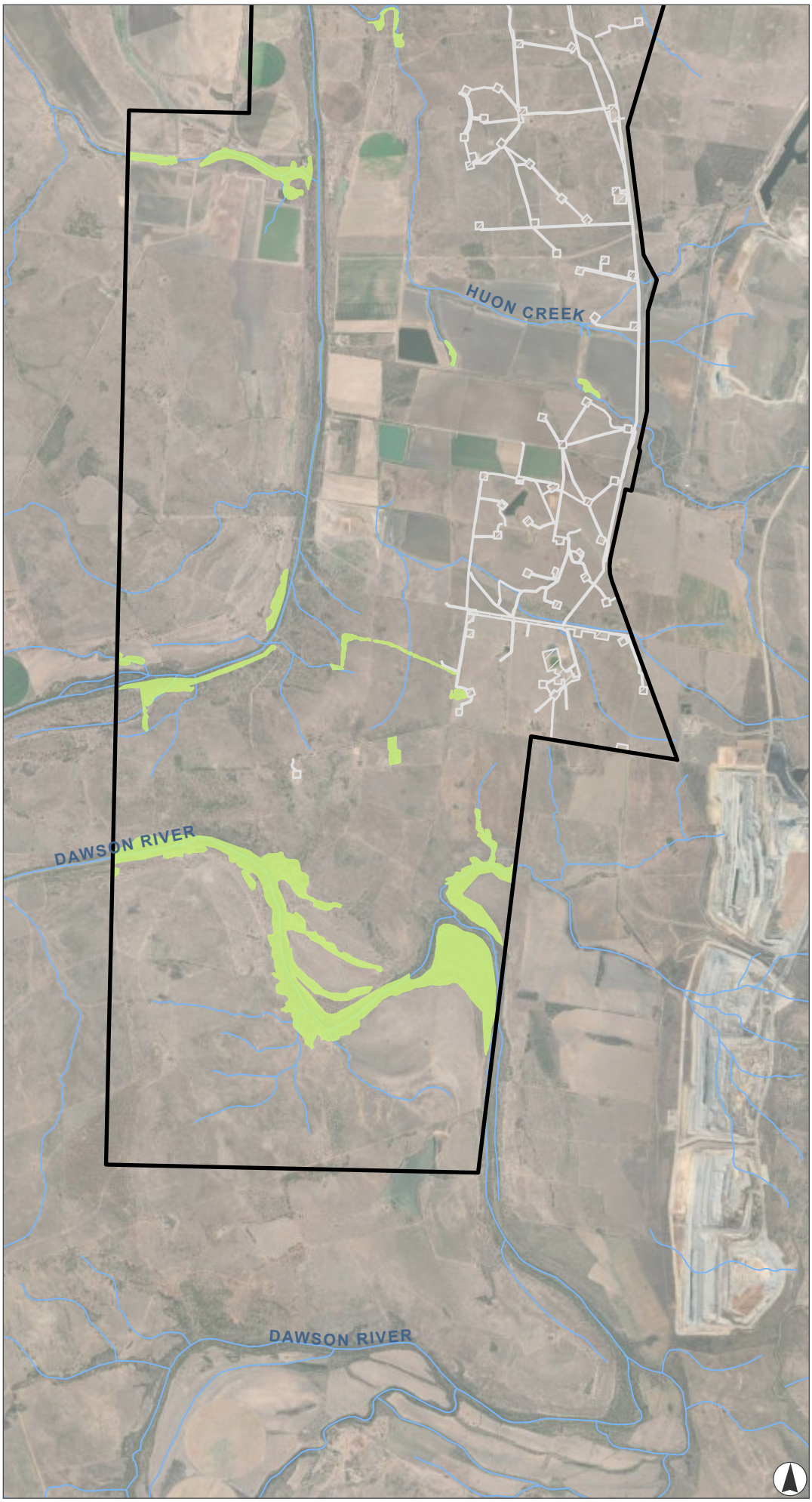


FIGURE 9.3C

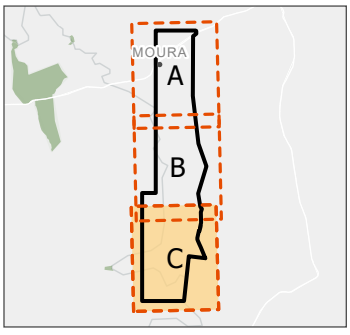
Poplar Box Woodland TEC Habitat Map

Legend

- Watercourse
- Project Area
- Existing Westside infrastructure

Poplar Box Woodland TEC Habitat

- Analogous RE but not TEC
- Potential



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9.4 *Xerothamnella herbacea*

9.4.1 Status under the EPBC Act

Xerothamnella herbacea is listed as Endangered under the EPBC Act.

9.4.2 Distribution and Habitat Requirements

Xerothamnella herbacea is endemic to QLD, known from the Banana-Theodore area, north of Injune, Durong-Chinchilla area and north of Yelarbon (DES, 2019b). Shapcott *et al.*, (2017a) completed a genetic, demographic and habitat evaluation of the species and confirmed twelve extant populations comprising approximately 6,659 individuals.

As outlined in the Approved Conservation Advice, *Xerothamnella herbacea* occurs in Brigalow (*Acacia harpophylla*) dominated communities in shaded situations, often in leaf litter and is associated with gilgais (shallow ground depressions). Specimen records in the QLD Herbarium suggest suitable soils are heavy, grey to dark brown clays. Seven REs are known to contain *Xerothamnella herbacea* including RE 11.3.1, 11.3.17, 11.4.8, 11.9.1, 11.9.2, 11.9.5 and 11.10.1 (Shapcott *et al.*, 2017).

Soil moisture is suggested to be a limiting factor for the species (Shapcott *et al.*, 2017). The species is known to occur in very specific micro-topographic locations, particularly on-stream terraces within 20 m of the stream channel, where moisture is retained. At a relatively recently discovered location in the southern Arcadia Valley, Boobook Ecological Consulting (2012) also noted the potential importance of drainage lines in mature and regrowth Brigalow communities as habitat for *Xerothamnella herbacea*. The canopy in Brigalow communities is also thought to play a role in providing favourable soil conditions including retaining soil moisture, allowing herbaceous species to persist over pasture species (Shapcott *et al.*, 2017). Therefore, it is expected that tree cover may be an important microhabitat feature for *Xerothamnella herbacea* to create the shaded situations to retain soil moisture.

9.4.3 Threats

The main threat to *Xerothamnella herbacea* identified by the Approved Conservation Advice is competition from invasive shade-tolerant species which may persist in the higher canopy cover environments that the species prefers (Department of the Environment Water Heritage and the Arts, 2008a). *Megathyrsus maximus** and to a lesser extent *Cenchrus ciliaris** are species which may colonise these habitats and outcompete *Xerothamnella herbacea*. Department of the Environment Water Heritage and the Arts (2008) also identified the main potential threats to the species as road widening and maintenance activities, surface erosion and grazing and trampling by cattle and native macropods.

Shapcott *et al.*, (2017a) identified that climate change leading to reduced rainfall in the region may impact the viability of *Xerothamnella herbacea* in the long-term.

9.4.4 Occurrence and Potential Habitat

This species is known to the Project Area and has been recorded five times during the September 2019 Umwelt field survey in areas associated with Kianga Creek. Recorded locations within the Project Area comprise brigalow (*Acacia harpophylla*) woodlands in remnant and regrowth condition analogous to RE 11.3.1.

ALA records within the Project Area include a cluster of three dated 2015 (one record) and 2022 (two records) along the Dawson Highway, and one record dated 2014 along Kianga Creek. Outside the Project Area, records dated 2010, 2017 and 2018 are scattered both upstream and downstream of Kianga Creek, one record from 2015 occurs off Moura Baralaba Road.

A total of 1,076.8 ha of suitable habitat is identified within the Project Area, including two small patches of known habitat (combined 1.8 ha). Mapped habitat includes all polygons containing RE 11.3.1, 11.3.17, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.9a, 11.9.1 and 11.9.5.

The extent of suitable habitat for *Xerothamnella herbacea* within the Project Area is likely to be overstated. Mapped habitat conservatively includes areas of HVR; however, it is likely these areas will be too degraded as a result of exotic perennial grass incursion or poor soil moisture from the thinned canopy. Mapped habitat within the Project Area also includes State mapped heterogenous polygons; although the full extent of these areas has been included, they may only partially contain an analogous RE (or may contain a different RE altogether). As areas are field verified, a decision will be made as to whether the vegetation meets the definition of suitable habitat, and the hierarchy of constraints will be followed.

The extent of mapped *Xerothamnella herbacea* habitat within the Project Area is provided below in **Table 9.8**, and the mapped habitat is shown on **Figure 9.4**.

Table 9.8 Habitat Extent for *Xerothamnella herbacea*

Mapped Type	Habitat Definition	Extent within the Project Area (ha)
Known	Any patch of vegetation confirmed via field survey by a qualified ecologist to contain the species.	1.8
Suitable	Open forests and woodland habitats where brigalow (*Acacia harpophylla*) dominates or co-dominates on heavy soils. Often in leaf litter and is associated with gilgais.	1,074.9
	Total	**1,076.8**

9.4.5 Important Populations

As this species is listed as Endangered under the EPBC Act, 'important populations' do not apply.

9.4.6 Habitat Critical to the Survival of the Species

There are no species-specific guidelines for determining habitat critical to the survival of *Xerothamnella herbacea*. Therefore, the generic *Significant Impact Guidelines Policy Statement 1.1* definition of habitat critical to the survival of a species has been applied. Based on information currently known about the habitat preferences for this species, patches containing the following micro-habitat features could be considered habitat critical to the survival of the species:

- Presence of canopy cover typical of remnant vegetation, promoting shade in the understory to retain soil moisture.
- Associated with small ephemeral creek and drainage line terraces and flats, where soil moisture is retained.

- Limited presence of weed species in the ground cover, particularly pasture species which are high in biomass.
- Presence of leaf litter.
- Association with gilgai.

Potential habitat that was field validated to contain the above habitat preferences is considered habitat critical to the survival. For mapped habitat, patches that are relatively large (> 1 ha) or moderately connected (occurring within 50 m of another patch) are conservatively considered to meet the definition of habitat critical to the survival of the species.

Of the total area of mapped suitable habitat, approximately 699.6 ha is considered known or likely to comprise habitat critical to the survival of the species.

9.4.7 Potential Project Impacts and Key Mitigation Measures

Direct impacts to any confirmed *Xerothamnella herbacea* individual will be avoided, and direct impacts on *Xerothamnella herbacea* habitat will be limited to a maximum of 1.0 ha. To ensure patch viability and functionality is maintained at current levels, the siting of Project infrastructure (including wells, gathering infrastructure, tracks and other ancillary infrastructure) within or adjacent to moderate constraint areas (including potential *Xerothamnella herbacea* habitat) will adhere to the following rules:

- Patches that are 0.5 ha or less must be completely avoided by the Project (no direct impacts permitted).
- Patches that are 1.0 ha or less must not be dissected in a way that creates two new patches.
- Direct impacts must not reduce the patch size to less than 0.5 ha OR isolate the patch by more than 50 m to the nearest patch (unless already isolated by more than 50 m).
- Patches >1.0 ha must not be dissected in a way that creates one patch <0.5 ha.

Potential indirect impacts on *Xerothamnella herbacea* as a result of the Project could include:

- increased edge effects
- further weed and pest incursion
- temporary periods of elevated dust, leading to potential declines in vegetation health.

General mitigation measures are outlined in **Section 8.2.1**. Mitigation measures specific to *Xerothamnella herbacea* are outlined in **Section 8.2.2** and below:

- Threatened flora individuals/populations and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of threatened flora populations and habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped).

- No direct impacts to any threatened flora plants listed under the EPBC Act will be permissible at any time throughout the life of the Project.
- A vegetation 'buffer zone' of 5 m or more will be established around identified locations of threatened flora species to ensure suitable micro-climatic conditions are maintained and weed incursion risks are reduced. The known threatened flora location, inclusive of the buffer zone, will be considered a 'no-go' zone to mitigate any occurrence of accidental damage or death as a result of trampling etc. Given the very small size of the plant and it's root system characteristics (able to root at the nodes that contact the soil), a 5 m buffer is considered sufficient.
- Patches confirmed to contain threatened flora individuals/populations and associated 'no-go' zones, adjacent to Project construction activities will be inspected by a suitably qualified ecologist prior to commencement and at completion of works, to ensure no unintentional indirect impacts have occurred in accordance with the methods outlined in the Project SSMP (MSG-GN00-HS-PLN-005).
- Where a plant is identified to potentially be a species' listed under the EPBC Act, but formal identification cannot be made at the time of surveying, the plants will be assumed to be the threatened species and managed accordingly until proper identification occurs.
- Direct impacts to potential habitat for the relevant threatened flora species (i.e. meets the habitat definition but did not contain any individuals or populations) are only permitted to a cumulative maximum disturbance limit of 1.0 ha. Direct impacts to potential threatened flora habitat will be avoided to the maximum extent possible.
- The extent of Project-related construction work (including equipment laydown and other non-clearing activities) proposed to occur within 5 m of threatened flora habitat will be demarcated using flagging tape, barricade webbing or similar, to avoid accidental clearing outside the approved disturbance area.
- The siting of Project infrastructure will aim to minimise fragmentation of potential habitat as much as possible (i.e. clear edges rather than dissect patches) to maintain core patch and population viability.
- No stockpiling of construction materials including excavated soil will occur in areas identified as threatened flora habitat.
- In the unlikely event that threatened flora plant listed under the EPBC Act is damaged, removed or killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days.
- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.
- Wherever landholder seed mix is not requested, rehabilitation works in areas adjacent to threatened flora habitat will prioritise the use of native species, to reduce increased incursion of weed species and/or exotic grass species (i.e. buffel grass) within the area. Rehabilitation will be undertaken in accordance with the Westside Rehabilitation Management Plan (WCL-0000-HS-PLN-011).

9.4.8 Significant Impact Assessment

The significant impact assessment for the species is present in **Table 9.9** below. In summary, the assessment found that the Project is **unlikely to result in a significant impact on *Xerothamnella herbacea***.

Table 9.9 Significant Impact Assessment – *Xerothamnella herbacea*

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Lead to a long-term decrease in the size of a population	*X. herbacea* is known to the Project Area, previously confirmed by Umwelt during a field survey in areas associated with Kianga Creek in the north. A total of 1,074.9 ha of potential *X. herbacea* habitat has been mapped within the Project Area, as well as 1.8 ha of confirmed habitat. Additional ecology field surveys will be undertaken in any areas proposed for development as part of the Project to ensure locations containing the species or its habitat are verified. Direct impacts to any confirmed *Xerothamnella herbacea* individual will be avoided, and direct impacts on *Xerothamnella herbacea* habitat will be limited to a maximum of 1.0 ha. Indirect impacts will be actively managed via Project management plans including but not limited to the SSMP and the EMP. Clearing works will maintain a vegetation buffer of 5 m or more around identified locations of threatened flora species to maintain suitable micro-climatic conditions. *X. herbacea* exhibits low to moderate genetic diversity due to its occurrence in an already highly fragmented landscape. The species utilises vegetative reproduction to maintain populations in the medium-term when environmental conditions may be unfavourable. It is also likely that seed dispersal for the species is highly localised. The Project is unlikely to reduce the population's ability to continue to exchange genetic material between individuals and reproduce at the local site scale. Therefore, due to the low maximum disturbance limit, it is unlikely that the Project will lead to a long-term decrease in the size of the population.	Unlikely
Reduce the area of occupancy of the species	The Project Area is located within the northern extent of the species' distribution, and partially within the 'likely to occur' extent of the species distribution. The current area of occupancy is not defined in the Conservation Advice for the species. However, Shapcott *et al.*, (2017a) estimated the total population size in areas of known habitat across its distribution (13 ha) for the species as 6,659 individuals. Additionally, habitat mapping identified 111,842 ha of high-quality habitat for *X. herbacea* as occurring between Goondiwindi and Banana in the north. A further 2,098,150 ha of medium quality habitat was mapped. Shapcott *et al.*, (2017a) identified that, based on the results of the study, there is potential for new populations to be identified, particularly in the north and west. Therefore, the distribution of *X. herbacea* may be greater than currently known. Direct impacts to any confirmed *Xerothamnella herbacea* individual will be avoided, and direct impacts on *Xerothamnella herbacea* habitat will be limited to a maximum of 1.0 ha. As such, the species' area of occupancy will not be significantly reduced.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Fragment an existing population into two or more populations	Direct impacts to any confirmed *Xerothamnella herbacea* individual will be avoided, and direct impacts on *Xerothamnella herbacea* habitat will be limited to a maximum of 1.0 ha. The presence of *X. herbacea* populations and habitat will be verified in areas proposed for development via ground truthing ecology surveys. The siting of infrastructure will aim to minimise fragmentation of potential habitat as much as possible (i.e. clear edges rather than dissect patches) to maintain core patch and population viability. Indirect impacts on the species will be actively managed throughout the life of the Project via multiple Project management plans including the SSMP and the EMP. Project activities are considered highly unlikely to affect the population's ability to continue to exchange genetic material between individuals and reproduce at the local site scale. It will not create a barrier to seed dispersal or vegetative reproduction. Therefore, the Project is unlikely to fragment the population in two or more populations.	Unlikely
Adversely affect habitat critical to the survival of a species	A total of 699.6 ha of known or potential habitat critical to the survival of the species has been identified within the Project Area. Direct impacts to any confirmed *Xerothamnella herbacea* individual will be avoided, and direct impacts on *Xerothamnella herbacea* habitat will be limited to a maximum of 1.0 ha. Indirect impacts to critical habitat will be actively managed via Project management plans including but not limited to the SSMP and the EMP. Clearing works will maintain a vegetation buffer of 5 m or more around identified locations of threatened flora species to maintain suitable micro-climatic conditions. The 5 m buffer zone will comprise a 'no-go' constraint category area to ensure the area is not traversed, minimising the potential for accidental disturbance or death to individuals as a result of trampling etc. The species has demonstrated the ability to persist in an already fragmented landscape. Patch size does not appear to be a limiting factor in population viability, as population patch sizes as small as 0.018 ha were recorded in a population at Banana in Shapcott *et al.*, (2017a). Based on the limited clearing of potential habitat, and the low risk of indirect impacts including edge effects, the Project is considered unlikely to adversely affect habitat critical to the survival of the species.	Unlikely
Disrupt the breeding cycle of a population	Shapcott *et al.*, (2017a) identified that reproductive timing among populations of *X. herbacea* was synchronous at a landscape-scale, suggesting that flowering of the species occurs in response to landscape-wide environmental conditions such as temperature. This has been reported to occur at various times throughout the year. When conditions are unfavourable, the species reproduces vegetatively on a micro-scale to ensure persistence of the species in the short to medium-term. Based on the broad timing of flowering and seeding as well as the species ability to reproduce vegetatively on a micro-scale, the likelihood of potential impacts on breeding arising due to the Project is very low. Direct impacts to any confirmed *Xerothamnella herbacea* individual will be avoided, and direct impacts on *Xerothamnella herbacea* habitat will be limited to a maximum of 1.0 ha. Therefore, it is unlikely that the Project will disrupt the breeding cycle of a population.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Direct impacts to any confirmed *Xerothamnella herbacea* individual will be avoided, and direct impacts on *Xerothamnella herbacea* habitat will be limited to a maximum of 1.0 ha. The species has demonstrated the ability to persist in an already fragmented landscape. Soil moisture has been identified as an important microhabitat for *X. herbacea* and the Project infrastructure is not expected to substantially alter surface water drainage. In addition to this, a number of good practice environmental management measures will be implemented to avoid and reduce the likelihood of impacts to the species and its habitat. This includes fire, grazing, weed and pest management measures. The Project is therefore considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, particularly when large areas of suitable habitat will remain within and surrounding the Project Area.	Unlikely
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Exotic pasture grasses are considered a recognised threat to the species. However, these occur relatively commonly across the Project Area including within areas of potential habitat as a result of ongoing agricultural work. Where Project activities are proposed in areas adjacent to habitat there is an increased risk of invasive species invading and or becoming established. However, this will be actively managed through the Westside Weed Management Procedure. Therefore, it is unlikely that the Project will result in invasive species that are harmful to *X. herbacea* becoming established in the species' habitat.	Unlikely
Introduce disease that may cause the species to decline, or	Disease has not been identified as a threat to *X. herbacea.* Nonetheless, the Project will adhere to relevant biosecurity and hygiene protocols to ensure disease is not introduced.	Unlikely
Interfere with the recovery of the species.	The Conservation Advice identifies a number of regional priority actions to support the recovery of *X. herbacea*, relevant to key themes including habitat loss, disturbance and modification, invasive weeds, trampling, browsing or grazing, fire and education. Westside are committing to a maximum direct impact on *Xerothamnella herbacea* habitat of 1.0 ha, and no direct impacts to any confirmed *Xerothamnella herbacea* individual. The risk of invasive species will be managed through the Weed Management Procedure. No changes to grazing threats are expected as a result of the Project. It is therefore considered unlikely the Project will interfere with the recovery of the species.	Unlikely

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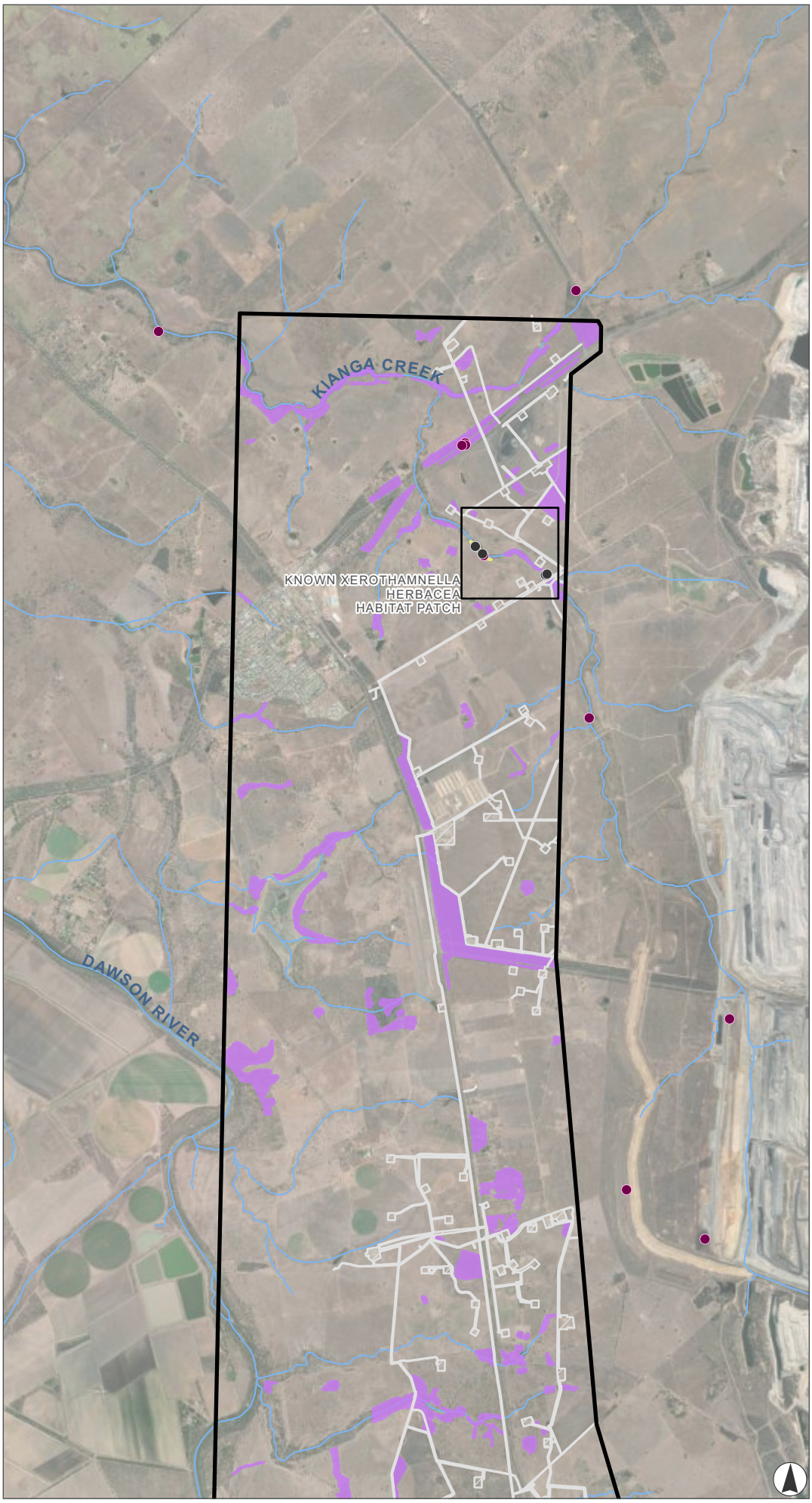
FIGURE 9.4A

Xerothamnella herbacea Habitat and Records



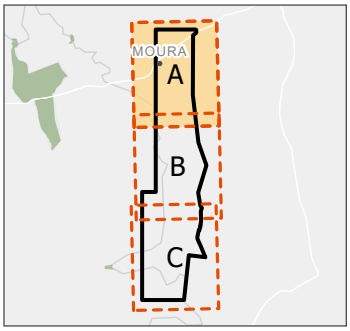
Legend

- Umwelt Records of *Xerothamnella herbacea*
- ALA Records of *Xerothamnella herbacea*
- Watercourse
- Project Area
- Existing Westside infrastructure

***Xerothemnella herbacea* habitat mapping**

- Known
- Potential





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Scale 1:80,000 at A4
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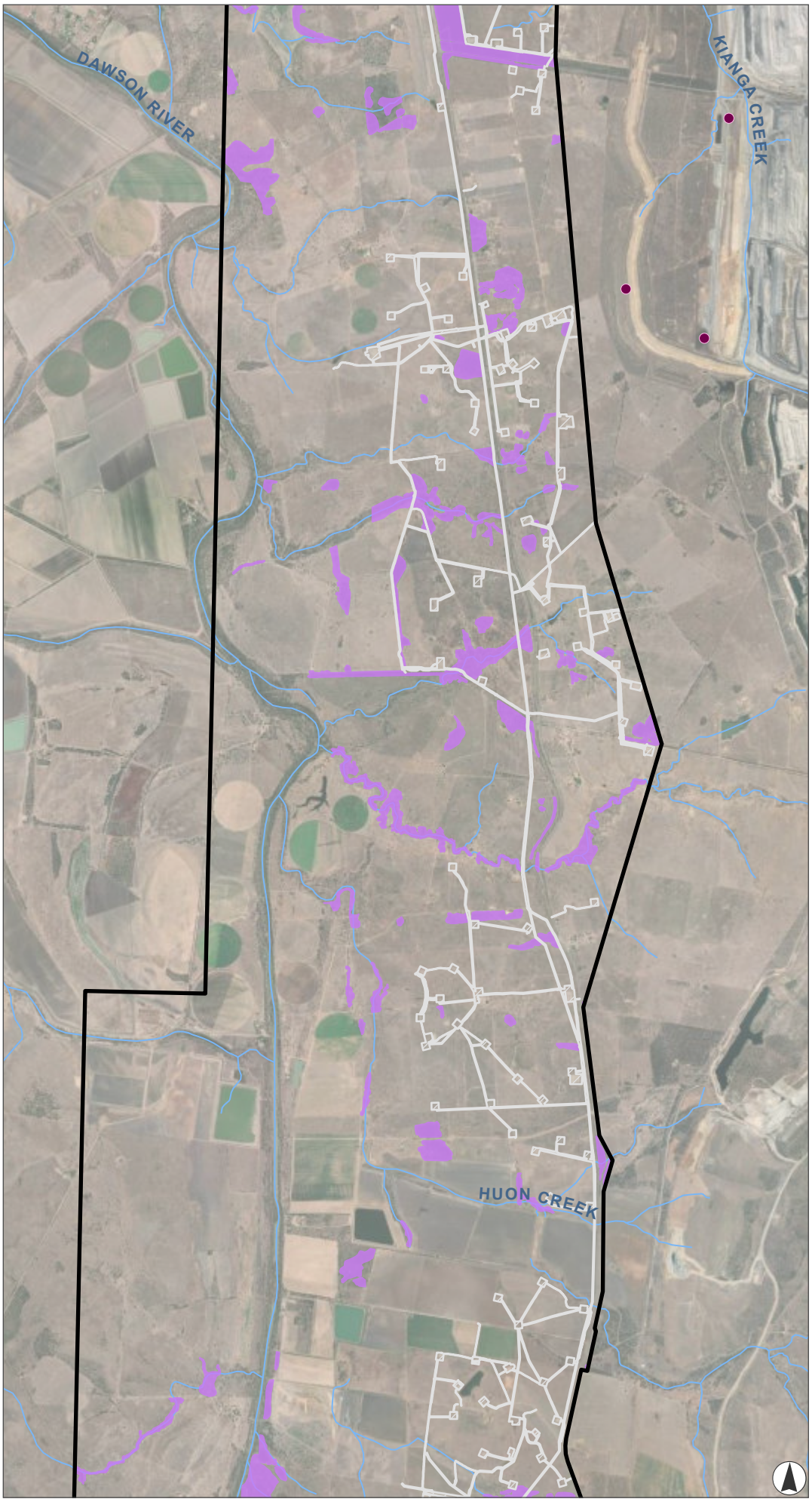


FIGURE 9.4B

Xerothamnella herbacea Habitat and Records

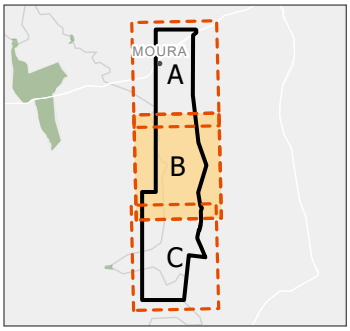
Legend

- Umwelt Records of *Xerothamnella herbacea*
- ALA Records of *Xerothamnella herbacea*
- Watercourse
- Project Area
- Existing Westside infrastructure

***Xerothemnella herbacea* habitat mapping**

- Potential





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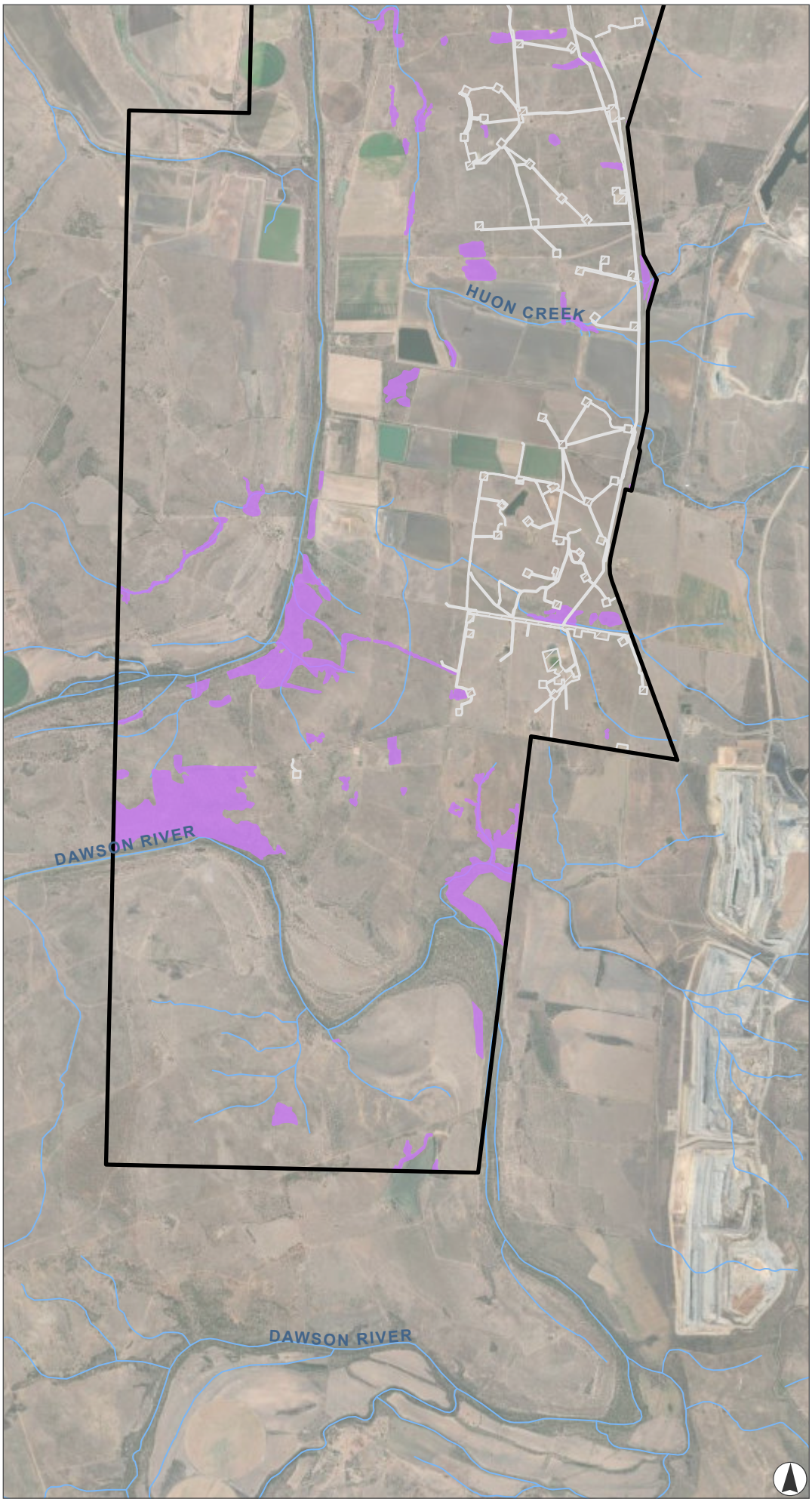


FIGURE 9.4C

Xerothamnella herbacea Habitat and Records

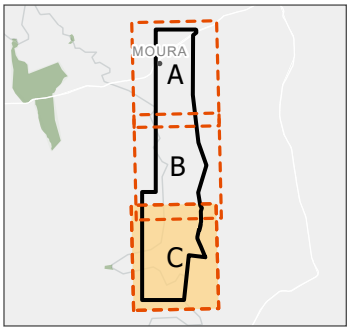
Legend

- Umwelt Records of *Xerothamnella herbacea*
- ALA Records of *Xerothamnella herbacea*
- Watercourse
- Project Area
- Existing Westside infrastructure

***Xerothemnella herbacea* habitat mapping**

- Potential





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9.5 *Solanum dissectum*

9.5.1 Status under the EPBC Act

Solanum dissectum is listed as Endangered under the EPBC Act.

9.5.2 Distribution and Habitat Requirements

Solanum dissectum is endemic to central QLD, known from a discontinuous area bounded by Banana, Dululu, Moura and Thangool as well as a location 40 km south of Blackwater (DES, 2019a). Within its distribution, populations are likely to be severely fragmented and restricted to very small, localised areas. No population estimates are available.

Suitable habitat for the species include open forest and woodland habitats where brigalow (*Acacia harpophylla*) and/or lapunyah (*Eucalyptus thozetiana*) characterise the dominant vegetation types on solodic clay soils (Threatened Species Scientific Committee, 2016a).

This species is poorly known and requires further research. There is no information available on the genetics, reproductive biology, dispersal, recruitment, or population structure of this species (Forster, 2007).

9.5.3 Threats

As per DES, (2019a), key threats to the species include:

- Vegetation clearing (especially the clearing of patches too small to be mapped remnant).
- Chance stochastic events (e.g. changes in drainage, drought, wildlife predation, fire) that may reduce population sizes or eliminate them entirely (all populations are particularly susceptible due to the fragmented nature of the vegetation remnants).
- Weed invasion of small vegetation remnants (e.g. exotic pasture grasses, especially buffel grass) that may affect fire fuel loads and reduce available resources or habitat for future recruitment (all populations).

The species' Conservation Advice (Threatened Species Scientific Committee, 2016a) also indicates that the ploughing or tilling of soil is a potential threat to the species, given the species dependence on rhizome networks for persistence. However, the species may respond positively to some disturbance such as wildlife and shallow mechanical disturbance.

A recovery plan is not required for the species, given the detail and direction provided in the Conservation Advice. However, it is noted that threats to the species are poorly understood. The primary conservation action identified is to "maintain and protect existing populations and protect and enhance habitat to provide potential for reproduction of plants within existing populations".

9.5.4 Occurrence and Potential Habitat

This species is known to the northern Project Area, recorded once during the September 2019 Umwelt field survey. The record is associated with a small (approximately 0.9 ha in size), isolated patch of remnant woodland dominated by brigalow (*Acacia harpophylla*) with lapunyah (*Eucalyptus thozetiana*) characterised as RE 11.4.9, located west of Kianga Creek. One ALA record is found within the Project Area, dated 2015. It is located in the north east corner along the Dawson Highway. Nearby records include one dated 2017 approximately 625 m east of the central region of the Project Area off Theodore Moura Road. Another is approximately 1,041 m east of the Study Area, off Gibihi Road dated 2018, with four other records directly north of the Project Area along Moura Baralaba Road (two dated 2015 and two dated 2014).

A total of 1,076.8 ha of suitable habitat is identified within the Project Area, including the single patch of known habitat (0.9 ha). Mapped habitat includes all polygons containing RE 11.3.1, 11.3.17, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.9a, 11.9.1 and 11.9.5.

The extent of suitable habitat for *Solanum dissectum* within the Project Area is likely to be overstated. Although likely to be too degraded as a result of exotic perennial grass incursion, mapped habitat conservatively includes areas of HVR. Mapped habitat within the Project Area also includes State mapped heterogenous polygons; although the full extent of these areas has been included, they may only partially contain an analogous RE (or may contain a different RE altogether). As areas are field verified, a decision will be made as to whether the vegetation meets the definition of suitable habitat, and the hierarchy of constraints will be followed.

The extent of mapped *Solanum dissectum* habitat within the Project Area is provided below in **Table 9.10**, and the mapped habitat is shown on **Figure 9.5**.

Table 9.10 Habitat Extent for *Solanum dissectum*

Mapped Type	Habitat Definition	Extent within the Project Area (ha)
Known	Any patch of vegetation confirmed via field survey by a qualified ecologist to contain the species.	0.9
Suitable	Open forests and woodland habitat where brigalow (*Acacia harpophylla*) and/ or lapunyah (*Eucalyptus thozetiana*) characterise the dominant vegetation types on solodic clay soils.	1,075.9
	Total	**1,076.8**

9.5.5 Important Populations

As this species is listed as Endangered under the EPBC Act, 'important populations' do not apply.

9.5.6 Habitat Critical to the Survival of the Species

There are no species-specific guidelines for determining habitat critical to the survival of *Solanum dissectum*. Therefore, the generic *Significant Impact Guidelines Policy Statement 1.1* definition of habitat critical to the survival of a species has been applied.

Based on the findings of the field surveys, the species habitat requirements and known threats, patches dominated by brigalow (*Acacia harpophylla*) with lapunyah (*Eucalyptus thozetiana*) could be considered habitat critical to the survival of the species if weed cover in the ground layer is low.

Potential habitat that was field validated to meet the above definition is considered habitat critical to the survival. For mapped habitat, all patches of RE 11.4.3, 11.4.8 or 11.4.9 are conservatively considered to meet the definition of habitat critical to the survival of the species. Only heterogeneous polygons that have the suitable REs as RE1 are included.

Of the total area of mapped suitable habitat, approximately 314.2 ha is considered known or likely habitat critical to the survival of the species.

9.5.7 Potential Project Impacts and Key Mitigation Measures

Direct impacts to any confirmed *Solanum dissectum* individual will be avoided, and direct impacts on *Solanum dissectum* habitat will be limited to a maximum of 1.0 ha. To ensure patch viability and functionality is maintained at current levels, the siting of Project infrastructure (including wells, gathering infrastructure, tracks and other ancillary infrastructure) within or adjacent to moderate constraint areas (including potential *Solanum dissectum* habitat) will adhere to the following rules:

- Patches that are 0.5 ha or less must be completed avoided by the Project (no direct impacts permitted).
- Patches that are 1.0 ha or less must not be dissected in a way that creates two new patches.
- Direct impacts must not reduce the patch size to less than 0.5 ha OR isolate the patch by more than 50 m to the nearest patch (unless already isolated by more than 50 m).
- Patches >1.0 ha must not be dissected in a way that creates one patch <0.5 ha.

Potential indirect impacts on *Solanum dissectum* as a result of the Project could include:

- increased edge effects.
- further weed and pest incursion.
- temporary periods of elevated dust, leading to potential declines in vegetation health.

General mitigation measures are outlined in **Section 8.2.1**. Mitigation measures specific to *Solanum dissectum* are outlined in **Section 8.2.2** and below:

- Threatened flora individuals/populations and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of threatened flora populations and habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped).
- No direct impacts to any threatened flora plants listed under the EPBC Act will be permissible at any time throughout the life of the Project.

- A vegetation 'buffer zone' of 5 m or more will be established around identified locations of threatened flora species to ensure suitable micro-climatic conditions are maintained and weed incursion risks are reduced. The known threatened flora location, inclusive of the buffer zone, will be considered a 'no-go' zone to mitigate any occurrence of accidental damage or death as a result of trampling etc. Given the very small size of the plant and it's root system characteristics (rhizomatous and may benefit from some disturbance), a 5 m buffer is considered sufficient.

- Patches confirmed to contain threatened flora individuals/populations and associated 'no-go' zones, adjacent to Project construction activities will be inspected by a suitably qualified ecologist prior to commencement and at completion of works, to ensure no unintentional indirect impacts have occurred in accordance with the methods outlined in the Project SSMP (MSG-GN00-HS-PLN-005).

- Where a plant is identified to potentially be a species' listed under the EPBC Act, but formal identification cannot be made at the time of surveying, the plants will be assumed to be the threatened species and managed accordingly until proper identification occurs.

- Direct impacts to potential habitat for the relevant threatened flora species (i.e. meets the habitat definition but did not contain any individuals or populations) are only permitted to a cumulative maximum disturbance limit of 1.0 ha. Direct impacts to potential threatened flora habitat will be avoided to the maximum extent possible.

- The extent of Project-related construction work (including equipment laydown and other non-clearing activities) proposed to occur within 5 m of threatened flora habitat will be demarcated using flagging tape, barricade webbing or similar, to avoid accidental clearing outside the approved disturbance area.

- The siting of Project infrastructure will aim to minimise fragmentation of potential habitat as much as possible (i.e. clear edges rather than dissect patches) to maintain core patch and population viability.

- No stockpiling of construction materials including excavated soil will occur in areas identified as threatened flora habitat.

- In the unlikely event that threatened flora plant listed under the EPBC Act is damaged, removed or killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days.

- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.

- Wherever landholder seed mix is not requested, rehabilitation works in areas adjacent to threatened flora habitat will prioritise the use of native species, to reduce increased incursion of weed species and/or exotic grass species (i.e. buffel grass) within the area. Rehabilitation will be undertaken in accordance with the Westside Rehabilitation Management Plan (WCL-0000-HS-PLN-011).

9.5.8 Significant Impact Assessment

The significant impact assessment for the species is present in **Table 9.11** below. In summary, the assessment found that the Project is **unlikely to result in a significant impact on *Solanum dissectum***.

Table 9.11 Significant Impact Assessment – *Solanum dissectum*

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Lead to a long-term decrease in the size of a population	*Solanum dissectum* is known to the Project Area, previously confirmed by Umwelt during a 2019 field survey. A total of 1,075.9 ha of *S. dissectum* potential habitat and 0.9 ha of known habitat has been mapped within the Project Area. Additional ecology field surveys will be undertaken in any areas proposed for development as part of the Project to ensure locations containing the species or its habitat are verified. Direct impacts to any confirmed *S. dissectum* individual will be avoided, and direct impacts on *S. dissectum* habitat will be limited to a maximum of 1.0 ha. Indirect impacts will be actively managed via Project management plans including but not limited to the SSMP and the EMP. It should be noted that given the species is rhizomatous, numbers of genetically distinct individuals may actually be very low. As such, clearing works should maintain a vegetation buffer of 5 m or more around identified locations of threatened flora species to maintain suitable micro-climatic conditions. It is also likely that seed dispersal for the species is highly localised. The Project is unlikely to reduce the population's ability to continue to exchange genetic material between individuals and reproduce at the local site scale. Therefore, due to the low maximum disturbance limit, it is unlikely that the Project will lead to a long-term decrease in the in the size of the population.	Unlikely
Reduce the area of occupancy of the species	The Project Area is located within the southern extent of the species' distribution, and partially within the 'likely to occur' extent of the species distribution. The species' area of occupancy is defined in the Conservation Advice as 36 km^2. It is recognised that populations are severely fragmented. Direct impacts to any confirmed *S. dissectum* individual will be avoided, and direct impacts on *S. dissectum* habitat will be limited to a maximum of 1.0 ha. As such, the species' area of occupancy is not likely to be reduced.	Unlikely
Fragment an existing population into two or more populations	Direct impacts to any confirmed *S. dissectum* individual will be avoided, and direct impacts on *S. dissectum* habitat will be limited to a maximum of 1.0 ha. The presence of *S. dissectum* populations and habitat will be verified in areas proposed for development via ground truthing ecology surveys. The siting of infrastructure will aim to minimise fragmentation of potential habitat as much as possible (i.e. clear edges rather than dissect patches) to maintain core patch and population viability. Indirect impacts on the species will be actively managed throughout the life of the Project via multiple Project management plans including the SSMP and the EMP. Project activities are considered highly unlikely to affect the population's ability to continue to exchange genetic material between individuals and reproduce at the local site scale. It will not create a barrier to seed dispersal or vegetative reproduction. Therefore, the Project is unlikely to fragment the population in two or more populations.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Adversely affect habitat critical to the survival of a species	A total of 314.2 ha of potential habitat critical to the survival of the species has been identified within the Project Area. Direct impacts to any confirmed *S. dissectum* individual will be avoided, and direct impacts on *S. dissectum* habitat will be limited to a maximum of 1.0 ha. Indirect impacts to critical habitat will be actively managed via Project management plans including but not limited to the SSMP and the EMP. Clearing works will maintain a vegetation buffer of 5 m or more around identified locations of threatened flora species to maintain suitable micro-climatic conditions. The 5 m buffer zone will comprise a 'no-go' constraint category area to ensure the area is not traversed, minimising the potential for accidental disturbance or death to individuals as a result of trampling etc. The species has demonstrated the ability to persist in an already fragmented landscape. Patch size does not appear to be a limiting factor in population viability. Based on the limited clearing of potential habitat, and the low risk of indirect impacts including edge effects, the Project is considered unlikely to adversely affect habitat critical to the survival of the species.	Unlikely
Disrupt the breeding cycle of a population	The species is likely to be a resprouting disturbance specialist with bird dispersal a likely vector (Threatened Species Scientific Committee, 2016a). Flowering occurs between July and November and fruiting between March and July each year. Based on the relatively broad timing of flowering and seeding, the likelihood of potential impacts on breeding arising due to the Project is considered low. Direct impacts to any confirmed *S. dissectum* individual will be avoided, and direct impacts on *S. dissectum* habitat will be limited to a maximum of 1.0 ha. Based on this, the Project is unlikely to reduce the size of pollinator populations to the extent that it disrupts the breeding cycle of a population.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The species has demonstrated the ability to persist in an already fragmented landscape. No changes to habitat quality are anticipated as a result of the Project with indirect impacts actively managed and no changes to surface water drainage or grazing pressures. Given this, and the limited direct disturbance proposed, no barrier to seed dispersal or vegetative reproduction will be created that may lead to species decline.	Unlikely
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Invasion of habitat by exotic pasture grasses us considered a recognised threat to the species. However, these grasses occur relatively commonly across the Project Area including within areas of potential habitat as a result of ongoing agricultural work. Where Project activities are proposed in areas adjacent to habitat there is an increased risk of invasive species invading and or becoming established. However, this will be actively managed through the Westside Weed Management Procedure. Therefore, it is unlikely that the Project will result in invasive species that are harmful to *S. dissectum* becoming established in the species' habitat.	Unlikely
Introduce disease that may cause the species to decline, or	Disease has not been identified as a threat to *S. dissectum.* Nonetheless, the Project will adhere to relevant biosecurity and hygiene protocols to ensure disease is not introduced.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Interfere with the recovery of the species.	As outlined on SPRAT, a recovery plan is not required for the species given the detail and direction provided in the Conservation Advice. The primary conservation action identified is to "maintain and protect existing populations and protect and enhance habitat to provide potential for reproduction of plants within existing populations". Westside are committing to a maximum direct impact on *S. dissectum* habitat of 1.0 ha, and no direct impacts to any confirmed *S. dissectum* individual. Westside will ensure the ongoing enforcement of their Weed Management Procedure to mitigate habitat degradation. It is therefore considered unlikely the Project will interfere with the recovery of the species.	Unlikely

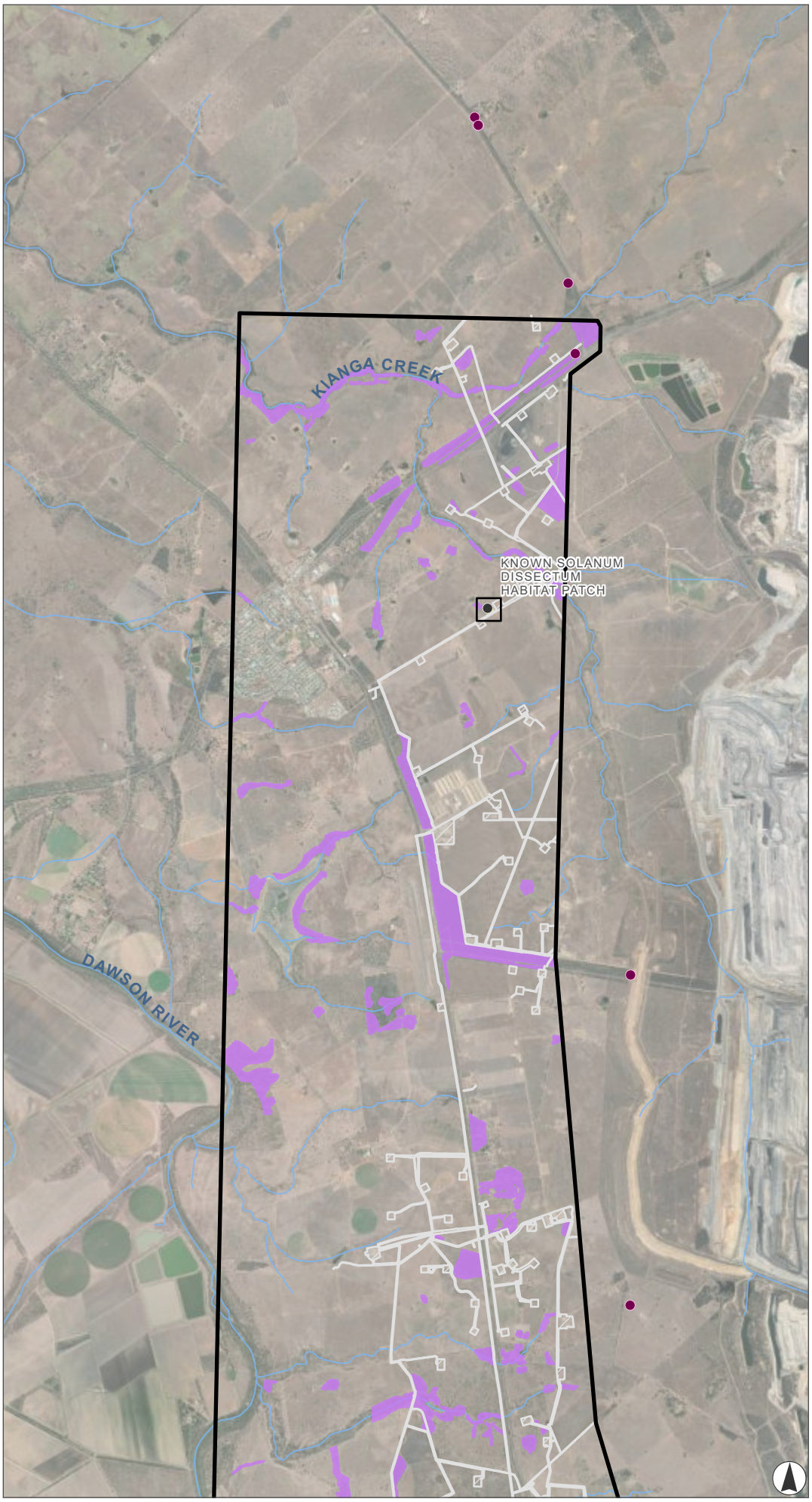


FIGURE 9.5A

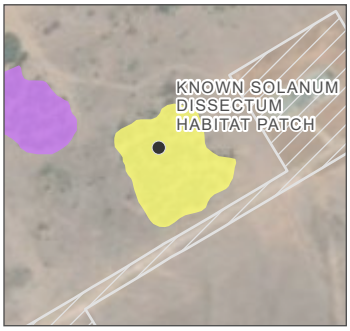
Solanum dissectum Habitat and Records

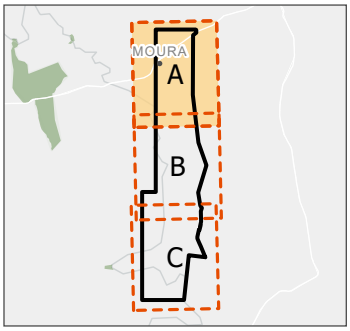
Legend

- Umwelt Records of *Solanum dissectum*
- ALA Records of *Solanum dissectum*
- Watercourse
- Project Area
- Existing Westside infrastructure

***Solanum dissectum* habitat mapping and records**

- Known
- Potential





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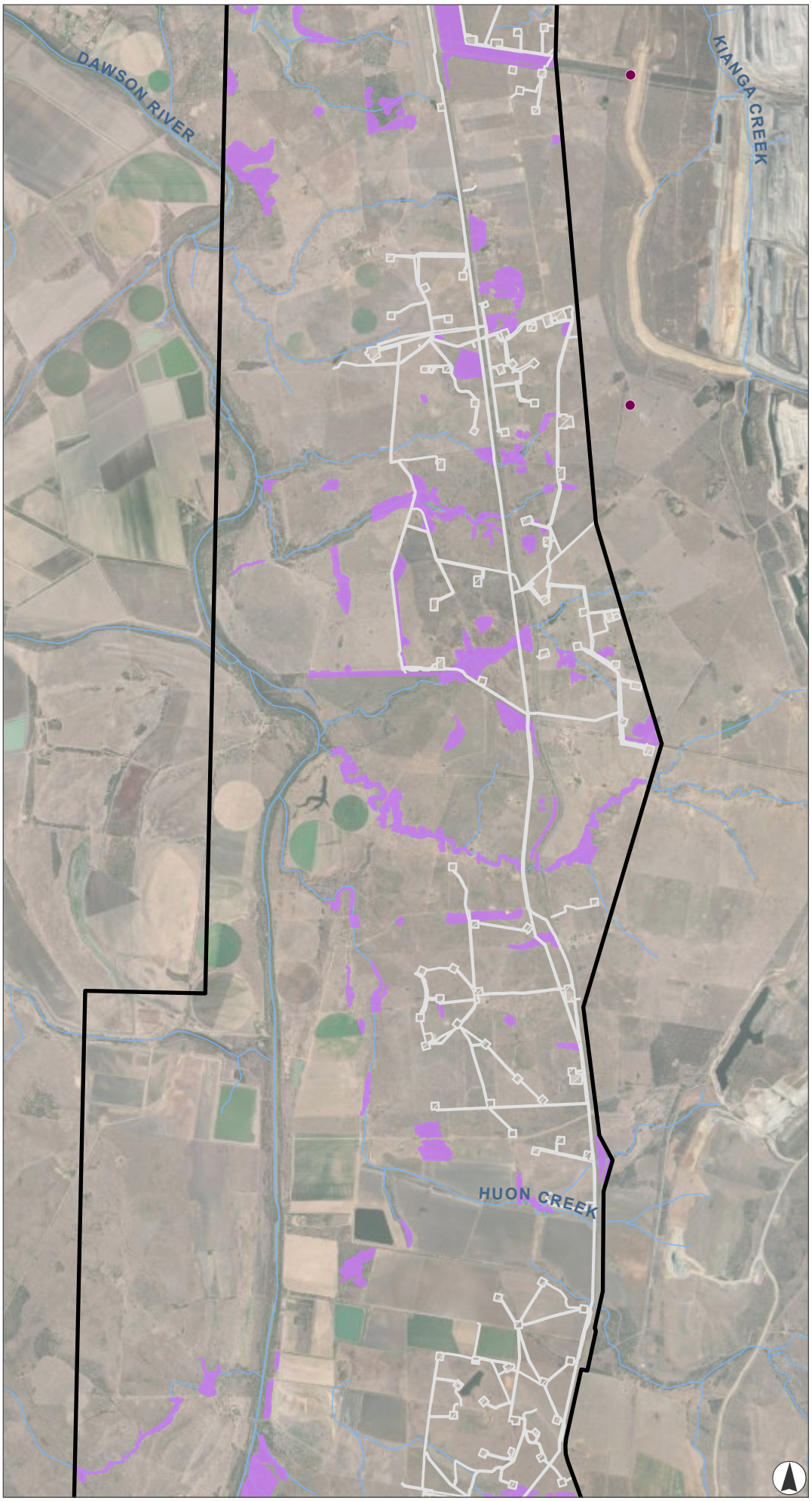


FIGURE 9.5B

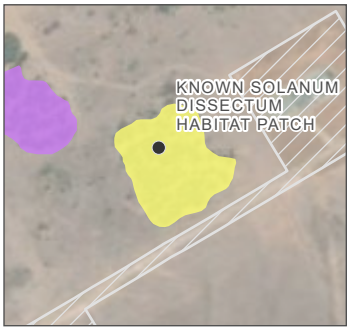
Solanum dissectum Habitat and Records

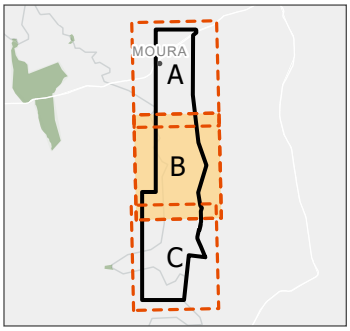
Legend

- Umwelt Records of *Solanum dissectum*
- ALA Records of *Solanum dissectum*
- Watercourse
- Project Area
- Existing Westside infrastructure

***Solanum dissectum* habitat mapping and records**

- Potential





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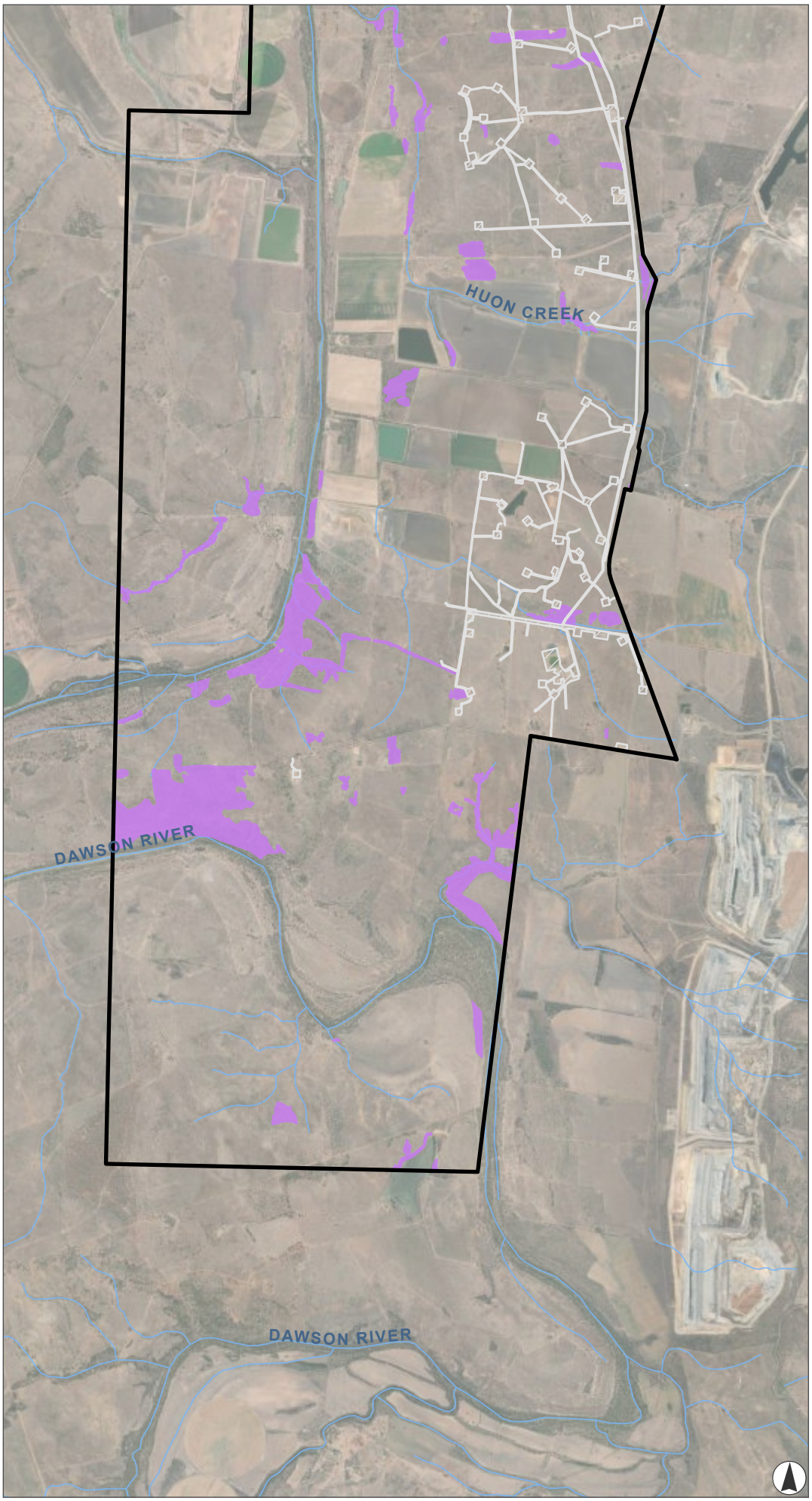


FIGURE 9.5C

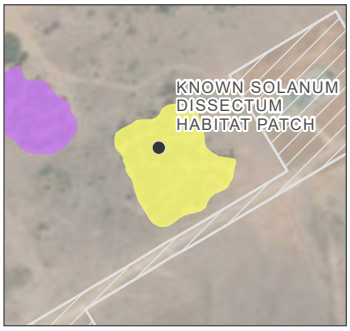
Solanum dissectum Habitat and Records

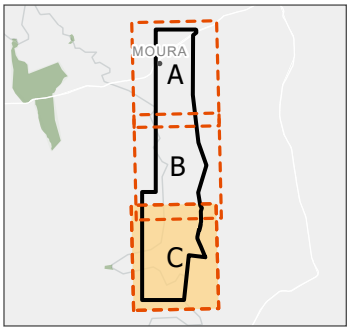
Legend

- Umwelt Records of *Solanum dissectum*
- ALA Records of *Solanum dissectum*
- Watercourse
- Project Area
- Existing Westside infrastructure

***Solanum dissectum* habitat mapping and records**

- Potential





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9.6 *Solanum johnsonianum*

9.6.1 Status under the EPBC Act

Solanum johnsonianum is listed as Endangered under the EPBC Act.

9.6.2 Distribution and Habitat Requirements

Solanum johnsonianum is endemic to central QLD, known from an area spanning approximately 100 km, extending from north-west of Theodore to north of Jambin (DES, 2022). Within its distribution there are nine known populations, which are restricted to very small localised areas and are highly isolated (Threatened Species Scientific Committee, 2016c). No population estimates are available.

Suitable habitat for the species includes open forest and woodland habitats where brigalow (*Acacia harpophylla*) dominates or co-dominates on heavy cracking clay soils. Lapunyah (*Eucalyptus thozetiana*) and wilga (*Geijera parviflora*) are known associations (Threatened Species Scientific Committee, 2016c). It often occurs after fire or disturbance.

This species is poorly known and requires further research. There is no information available on the genetics, reproductive biology, dispersal, recruitment or population structure of this species.

9.6.3 Threats

Solanum johnsonianum has disappeared from previous localities, and recent data suggests the species is currently known from three locations. As per DES (2022), key threats to the species include:

- vegetation clearing
- intensive grazing by herbivores, including wallabies
- invasion by exotic pasture grasses.

Similar to *Solanum dissectum*, soil ploughing and tilling is identified as a potential threat to the species, given the species dependence on rhizome networks for persistence. However the species may respond positively to some disturbance such as wildlife and shallow mechanical disturbance (Threatened Species Scientific Committee, 2016c).

A recovery plan is not required for the species, given the detail and direction provided in the Conservation Advice. The primary conservation action identified is to “maintain and protect existing populations and protect and enhance habitat to provide potential for reproduction of plants within existing populations”.

9.6.4 Occurrence and Potential Habitat

This species is known to the Project Area, recorded by Umwelt seven times within the Gibihi Road reserve during an October 2019 field survey. The species was also recorded within a different section of the Gibihi Road reserve during the June 2023 survey, and during the 2024 field survey in one location north of Nipan River Road on private property. Recorded locations comprise brigalow (*Acacia harpophylla*) woodlands in remnant condition analogous to REs 11.4.8 and 11.4.9 and in regrowth analogous to RE 11.3.1. Recent ALA records (dated 2014, 2015 and 2022) for the species also exist within the far north-eastern Project Area, located immediately north of the Dawson Highway. A historical ALA record (dated 1963) also occurs in the central Project Area, north of Kianga River Road.

A total of 1,076.8 ha of suitable habitat is identified within the Project Area, including 32.7 ha of habitat known to support the species. Mapped habitat includes all polygons containing RE 11.3.1, 11.3.17, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.9a, 11.9.1 and 11.9.5.

The extent of suitable habitat for *Solanum johnsonianum* within the Project Area is likely to be overstated. Although likely to be too degraded as a result of exotic perennial grass incursion, mapped habitat conservatively includes areas of HVR. Mapped habitat within the Project Area also includes State mapped heterogenous polygons; although the full extent of these areas has been included, they may only partially contain an analogous RE (or may contain a different RE altogether). As areas are field verified, a decision will be made as to whether the vegetation meets the definition of suitable habitat, and the hierarchy of constraints will be followed.

The extent of mapped *Solanum johnsonianum* habitat within the Project Area is provided below in **Table 9.12**, and the mapped habitat is shown on **Figure 9.6.**

Table 9.12 Habitat Extent for *Solanum johnsonianum*

Mapped Type	Habitat Definition	Extent within the Project Area (ha)
Known	Any patch of vegetation confirmed via field survey by a qualified ecologist to contain the species.	32.7
Suitable	Open forest and woodland habitats where brigalow (*Acacia harpophylla*) dominates or co-dominates on heavy cracking clay soils. Other associated species include lapunyah (*Eucalyptus thozetiana*) with and understory of wilga (*Geijera parviflora*).	1,044.0
	Total	**1,076.8**

9.6.5 Important Populations

As this species is listed as Endangered under the EPBC Act, 'important populations' do not apply.

9.6.6 Habitat Critical to the Survival of the Species

There are no species-specific guidelines for determining habitat critical to the survival of *Solanum johnsonianum*. Therefore, the generic *Significant Impact Guidelines Policy Statement 1.1* definition of habitat critical to the survival of a species has been applied.

Based on the findings of the field surveys, the species habitat requirements and known threats, patches dominated by brigalow (*Acacia harpophylla*), including areas associated with lapunyah (*Eucalyptus thozetiana*), could be considered habitat critical to the survival of the species if weed cover in the ground layer is low.

Potential habitat that was field validated to meet the above definition is considered habitat critical to the survival. For mapped habitat, all patches of RE 11.4.3, 11.4.8 or 11.4.9 are conservatively considered to meet the definition of habitat critical to the survival of the species. Only heterogeneous polygons that have the suitable REs as RE1 are included.

Of the total area of mapped suitable habitat, approximately 284.1 ha is considered known or likely habitat critical to the survival of the species.

9.6.7 Potential Project Impacts and Key Mitigation Measures

Direct impacts to any confirmed *Solanum johnsonianum* individual will be avoided, and direct impacts on *Solanum johnsonianum* habitat will be limited to a maximum of 1.0 ha. To ensure patch viability and functionality is maintained at current levels, the siting of Project infrastructure (including wells, gathering infrastructure, tracks and other ancillary infrastructure) within or adjacent to moderate constraint areas (including potential *Solanum johnsonianum* habitat) will adhere to the following rules:

- Patches that are 0.5 ha or less must be completed avoided by the Project (no direct impacts permitted).
- Patches that are 1.0 ha or less must not be dissected in a way that creates two new patches.
- Direct impacts must not reduce the patch size to less than 0.5 ha OR isolate the patch by more than 50 m to the nearest patch (unless already isolated by more than 50 m).
- Patches >1.0 ha must not be dissected in a way that creates one patch <0.5 ha.

Potential indirect impacts on *Solanum johnsonianum* as a result of the Project includes:

- increased edge effects
- further weed and pest incursion
- temporary periods of elevated dust, leading to potential declines in vegetation health.

General mitigation measures are outlined in **Section 8.2.1**. Mitigation measures specific to *Solanum johnsonianum* are outlined in **Section 8.2.2** and below:

- Threatened flora individuals/populations and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of threatened flora populations and habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped).
- No direct impacts to any threatened flora plants listed under the EPBC Act will be permissible at any time throughout the life of the Project.

- A vegetation 'buffer zone' of 5 m or more will be established around identified locations of threatened flora species to ensure suitable micro-climatic conditions are maintained and weed incursion risks are reduced. The known threatened flora location, inclusive of the buffer zone, will be considered a 'no-go' zone to mitigate any occurrence of accidental damage or death as a result of trampling etc. Given the very small size of the plant and it's root system characteristics (rhizomatous and may benefit from some disturbance), a 5 m buffer is considered sufficient.

- Patches confirmed to contain threatened flora individuals/populations and associated 'no-go' zones, adjacent to Project construction activities will be inspected by a suitably qualified ecologist prior to commencement and at completion of works, to ensure no unintentional indirect impacts have occurred in accordance with the methods outlined in the Project SSMP (MSG-GN00-HS-PLN-005).

- Where a plant is identified to potentially be a species' listed under the EPBC Act, but formal identification cannot be made at the time of surveying, the plants will be assumed to be the threatened species and managed accordingly until proper identification occurs.

- Direct impacts to potential habitat for the relevant threatened flora species (i.e. meets the habitat definition but did not contain any individuals or populations) are only permitted to a cumulative maximum disturbance limit of 1.0 ha. Direct impacts to potential threatened flora habitat will be avoided to the maximum extent possible.

- The extent of Project-related construction work (including equipment laydown and other non-clearing activities) proposed to occur within 5 m of threatened flora habitat will be demarcated using flagging tape, barricade webbing or similar, to avoid accidental clearing outside the approved disturbance area.

- The siting of Project infrastructure will aim to minimise fragmentation of potential habitat as much as possible (i.e. clear edges rather than dissect patches) to maintain core patch and population viability.

- No stockpiling of construction materials including excavated soil will occur in areas identified as threatened flora habitat.

- In the unlikely event that threatened flora plant listed under the EPBC Act is damaged, removed or killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days.

- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.

- Wherever landholder seed mix is not requested, rehabilitation works in areas adjacent to threatened flora habitat will prioritise the use of native species, to reduce increased incursion of weed species and/or exotic grass species (i.e. buffel grass) within the area. Rehabilitation will be undertaken in accordance with the Westside Rehabilitation Management Plan (WCL-0000-HS-PLN-011).

9.6.8 Significant Impact Assessment

The significant impact assessment for the species is present in **Table 9.13** below. In summary, the assessment found that the Project is **unlikely to result in a significant impact on *Solanum johnsonianum***.

Table 9.13 Significant Impact Assessment – *Solanum johnsonianum*

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Lead to a long-term decrease in the size of a population	*Solanum johnsonianum* is known to the Project Area, previously confirmed by Umwelt during a 2019 field survey. A total of 1,044.0 ha of *S. johnsonianum* potential habitat has been mapped within the Project Area, as well as 32.7 ha of known habitat. Additional ecology field surveys will be undertaken in any areas proposed for development as part of the Project to ensure locations containing the species or its habitat are verified. Direct impacts to any confirmed *S. johnsonianum* individual will be avoided, and direct impacts on *S. johnsonianum* habitat will be limited to a maximum of 1.0 ha. Indirect impacts will be actively managed via Project management plans including but not limited to the SSMP and the EMP. It should be noted that given the species is rhizomatous, numbers of genetically distinct individuals may actually be very low. As such, clearing works should maintain a vegetation buffer of 5 m or more around identified locations of threatened flora species to maintain suitable micro-climatic conditions. It is also likely that seed dispersal for the species is highly localised. The Project is unlikely to reduce the population's ability to continue to exchange genetic material between individuals and reproduce at the local site scale. Therefore, due to the low maximum disturbance limit, it is unlikely that the Project will lead to a long-term decrease in the size of the population.	Unlikely
Reduce the area of occupancy of the species	The Project Area is located within the southern extent of the species' distribution, and partially within the 'likely to occur' extent of the species distribution. The species' area of occupancy is defined in the Conservation Advice as 60 km^2. It is recognised that populations are severely fragmented. Direct impacts to any confirmed *S. johnsonianum* individual will be avoided, and direct impacts on *S. johnsonianum* habitat will be limited to a maximum of 1.0 ha. As such, the species' area of occupancy is not likely to be reduced.	Unlikely
Fragment an existing population into two or more populations	Direct impacts to any confirmed *S. johnsonianum* individual will be avoided, and direct impacts on *S. johnsonianum* habitat will be limited to a maximum of 1.0 ha. The presence of *S. johnsonianum* populations and habitat will be verified in areas proposed for development via ground truthing ecology surveys. The siting of infrastructure will aim to minimise fragmentation of potential habitat as much as possible (i.e. clear edges rather than dissect patches) to maintain core patch and population viability. Indirect impacts on the species will be actively managed throughout the life of the Project via multiple Project management plans including the SSMP and the EMP. Project activities are considered highly unlikely to affect the population's ability to continue to exchange genetic material between individuals and reproduce at the local site scale. It will not create a barrier to seed dispersal or vegetative reproduction. Therefore, the Project is unlikely to fragment the population in two or more populations.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Adversely affect habitat critical to the survival of a species	A total of 284.1 ha of habitat critical to the survival of the species has been identified within the Project Area. Direct impacts to any confirmed *S. johnsonianum* individual will be avoided, and direct impacts on *S. johnsonianum* habitat will be limited to a maximum of 1.0 ha. Indirect impacts to critical habitat will be actively managed via Project management plans including but not limited to the SSMP and the EMP. Clearing works will maintain a vegetation buffer of 5 m or more around identified locations of threatened flora species to maintain suitable micro-climatic conditions. The 5 m buffer zone will comprise a 'no-go' constraint category area to ensure the area is not traversed, minimising the potential for accidental disturbance or death to individuals as a result of trampling etc. The species has demonstrated the ability to persist in an already fragmented landscape. Patch size does not appear to be a limiting factor in population viability. Based on the limited clearing of potential habitat, and the low risk of indirect impacts including edge effects, the Project is considered unlikely to adversely affect habitat critical to the survival of the species.	Unlikely
Disrupt the breeding cycle of a population	Flowering of *S. johnsonianum* has been recorded in March to June and between August and September, while fruiting has been recorded in April and May, but possibly extends over a longer period. Based on the relatively broad timing of flowering and seeding, the likelihood of potential impacts on breeding arising due to the Project is considered low. Direct impacts to any confirmed *S. johnsonianum* individual will be avoided, and direct impacts on *S. johnsonianum* habitat will be limited to a maximum of 1.0 ha. Based on this, the Project is unlikely to reduce the size of pollinator populations to the extent that it disrupts the breeding cycle of a population.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The species has demonstrated the ability to persist in an already fragmented landscape. No changes to habitat quality are anticipated as a result of the Project with indirect impacts actively managed and no changes to surface water drainage or grazing pressures. Given this, and the limited direct disturbance proposed, no barrier to seed dispersal or vegetative reproduction will be created that may lead to species decline.	Unlikely
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Although threats to the species are not well known, invasion of habitat by exotic pasture grasses is considered a likely major threat to the species. However, these grasses occur relatively commonly across the Project Area including within areas of potential habitat as a result of ongoing agricultural work. Where Project activities are proposed in areas adjacent to habitat there is an increased risk of invasive species invading and or becoming established. However, this will be actively managed through the Westside Weed Management Procedure. Therefore, it is unlikely that the Project will result in invasive species that are harmful to *S. johnsonianum* becoming established in the species' habitat.	Unlikely
Introduce disease that may cause the species to decline, or	Disease has not been identified as a threat to *S. johnsonianum.* Nonetheless, the Project will adhere to relevant biosecurity and hygiene protocols to ensure disease is not introduced.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Interfere with the recovery of the species.	As outlined on SPRAT, a recovery plan is not required for the species given the detail and direction provided in the Conservation Advice. The primary conservation action identified is to "maintain and protect existing populations and protect and enhance habitat to provide potential for reproduction of plants within existing populations". Westside are committing to a maximum direct impact on *S. johnsonianum* habitat of 1.0 ha, and no direct impacts to any confirmed *S. johnsonianum* individual. Westside will ensure the ongoing enforcement of their Weed Management Procedure to mitigate habitat degradation. It is therefore considered unlikely the Project will interfere with the recovery of the species.	Unlikely

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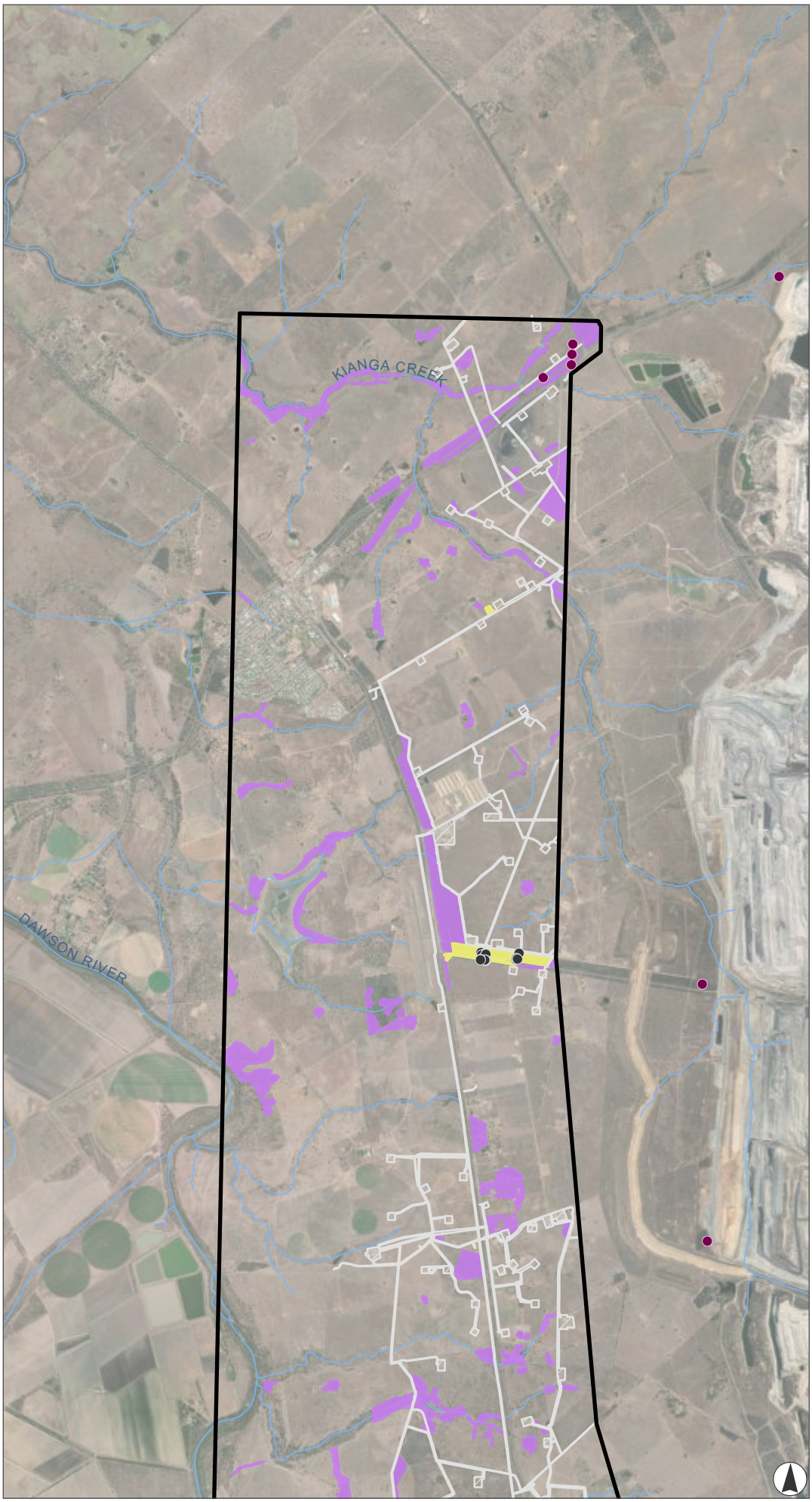


FIGURE 9.6A

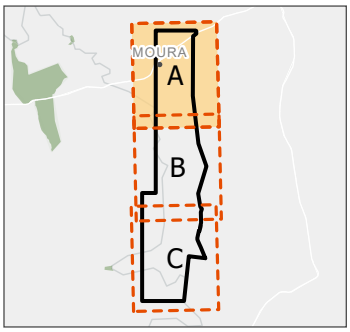
Solanum johnsonianum Habitat and Records

Legend

- Umwelt Records of *Solanum johnsonianum*
- ALA Records of *Solanum johnsonianum*
- Watercourse
- Project Area
- Existing Westside infrastructure

***Solanum johnsonianum* habitat mapping and records**

- Known
- Potential



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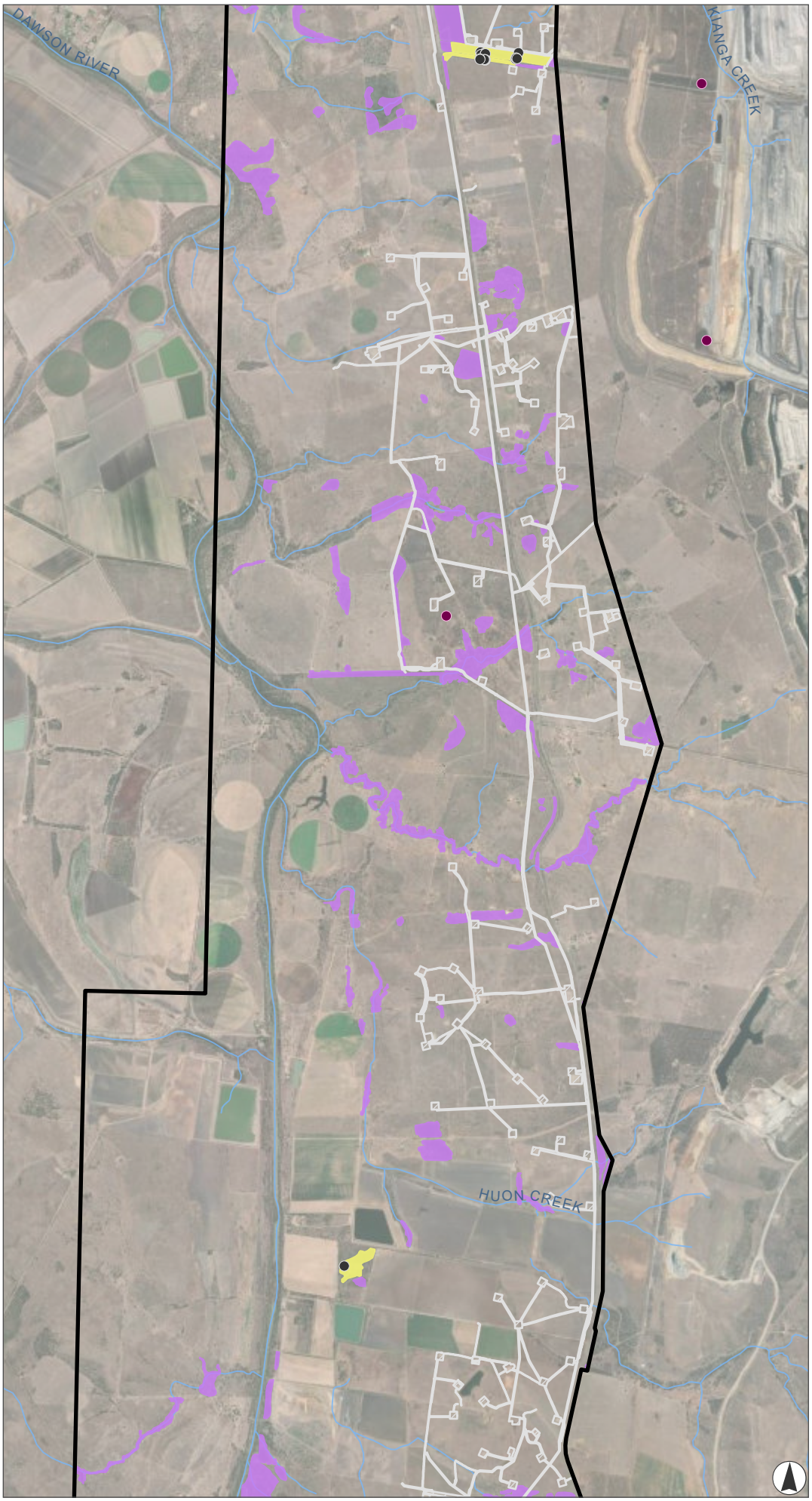


FIGURE 9.6B

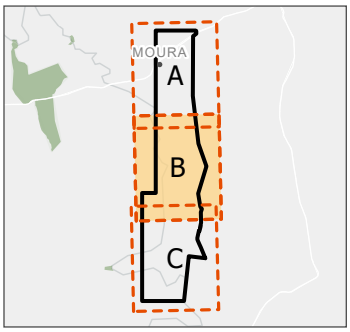
Solanum johnsonianum Habitat and Records

Legend

- Umwelt Records of *Solanum johnsonianum*
- ALA Records of *Solanum johnsonianum*
- Watercourse
- Project Area
- Existing Westside infrastructure

***Solanum johnsonianum* habitat mapping and records**

- Known
- Potential



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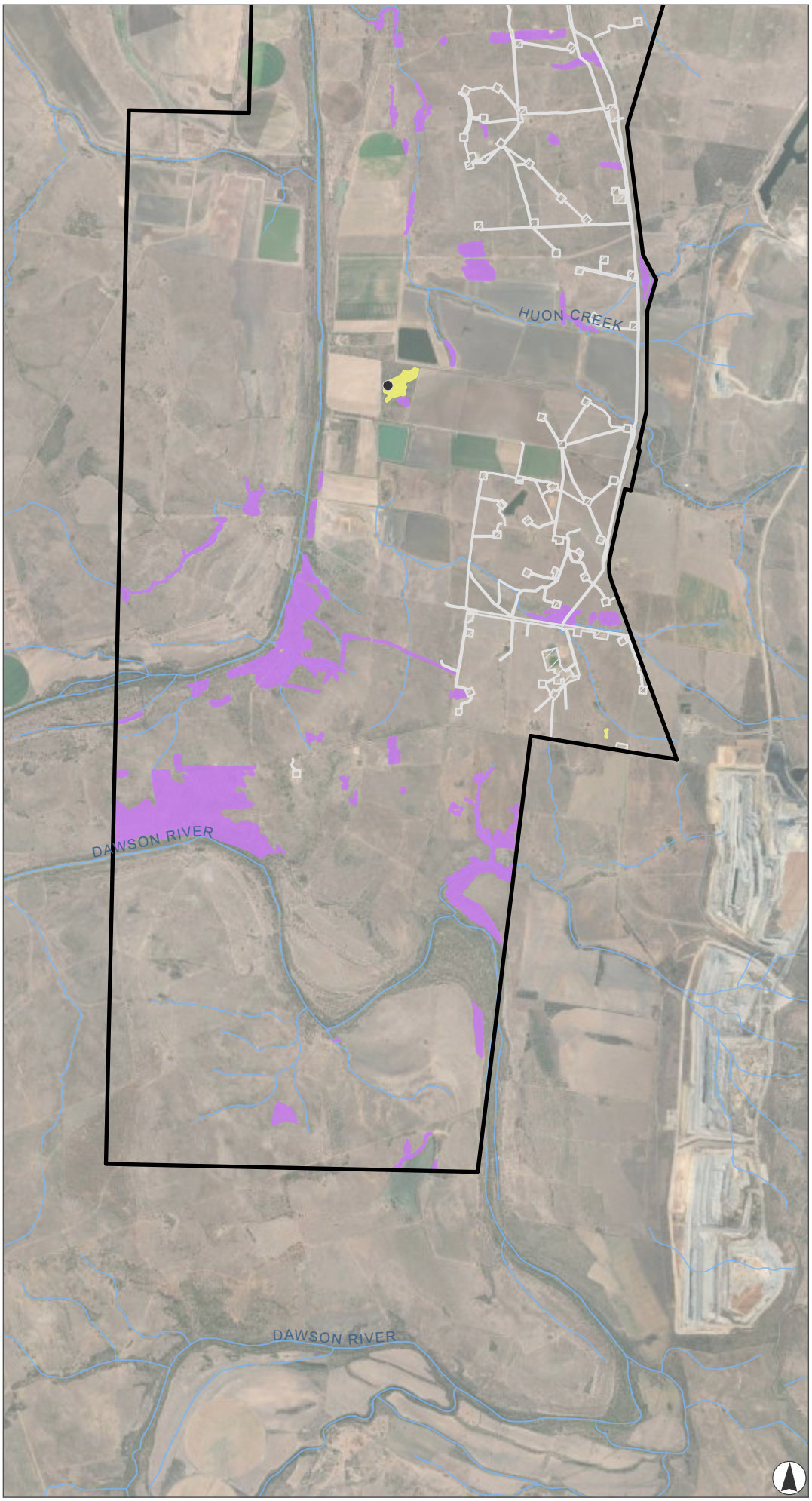


FIGURE 9.6C

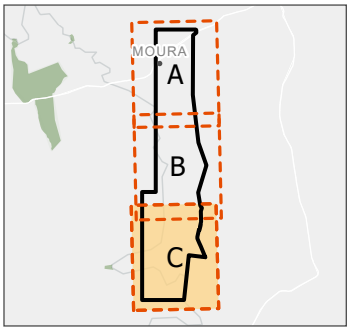
Solanum johnsonianum Habitat and Records

Legend

- Umwelt Records of *Solanum johnsonianum*
- Watercourse
- Project Area
- Existing Westside infrastructure

***Solanum johnsonianum* habitat mapping and records**

- Known
- Potential



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9.7 Squatter pigeon (southern) (*Geophaps scripta scripta*)

9.7.1 Status under the EPBC Act

The squatter pigeon (southern) is listed Vulnerable under the EPBC Act.

9.7.2 Distribution and Habitat Requirements

The squatter pigeon (southern) occurs on the inland slopes of the Great Dividing Range, from the Burdekin-Lynd Divide in central QLD, south to West Wyalong in northern NSW. As per the species SPRAT, the known distribution is estimated to occur within the latitudes, 17° to 30° S, and the longitudes, 141° to 153° 30' E (Department of Climate Change Energy the Environment and Water, 2022). As per the distribution map on SPRAT, the Project Area occurs in the central part of the subspecies range, in the 'likely to occur' extent.

North of the Carnarvon Ranges in Central QLD and possibly in the area between Injune and the Carnarvon Ranges, the species is relatively common and likely to comprise a single, continuous sub-population. Populations in the southern parts of the subspecies' distribution however (i.e. south of Injune and Tin Can Bay, QLD and NSW) are largely fragmented and isolated; in these areas there have also been noticeable disappearances. The southern boundary of the known distribution of the squatter pigeon (southern) is contracting northwards (Department of Climate Change Energy the Environment and Water, 2022).

The subspecies is known to access suitable waterbodies to drink on a daily basis, including permanent or seasonal rivers, creeks, lakes, ponds and waterholes, and artificial dams. The subspecies prefers to drink where there is gently sloping, bare ground on which to approach and stand at the water's edge.

The requirements for breeding and foraging habitat are well defined. Breeding habitat comprises remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species, on sandy or gravelly soils (predominantly areas mapped as QLD land zones 3, 5 or 7) within 1 km of a suitable waterbody (Department of Climate Change Energy the Environment and Water, 2022). Foraging habitat is almost identical, however occurring within 3 km of a suitable waterbody. As described on SPRAT, the ground layer vegetation in foraging and breeding habitat is patchy consisting of native, perennial tussock grasses or a mix of perennial tussock grasses and low shrubs or forbs. This patchy, ground layer of vegetation rarely exceeds 33% of the ground area. The remaining ground surface consisting of bare patches of gravelly or dusty soil and areas lightly covered in leaf litter and coarse, woody debris (e.g. fallen trees, logs and smaller debris) (Department of Climate Change Energy the Environment and Water, 2022).

Although breeding can occur throughout the year if conditions are favourable, breeding generally coincides with the dry season (April to October) when their primary food source (grass seed) is most abundant. The nest is a depression scraped into the ground beneath a tussock of grass, bush, fallen tree or log and is sparsely lined with grass.

Squatter pigeon (southern) dispersal habitat is any forest or woodland occurring between patches of foraging or breeding habitat, and suitable waterbodies. Such patches facilitate the local movement of the subspecies between patches of foraging habitat, breeding habitat and/or waterbodies, or the wider dispersal of individuals in search of reliable water sources during the dry season or droughts.

9.7.3 Threats

The key threats to the subspecies are the loss and fragmentation of habitat, the degradation of habitat by overgrazing by domesticated herbivores, habitat degradation by invasive weeds such as buffel grass (*Cenchrus ciliaris**), and predation by invasive fauna including foxes (*Vulpes vulpes*) and cats (*Felis catus*) (Department of Climate Change Energy the Environment and Water, 2022). Feral cats and foxes are likely to have the greatest impact upon the squatter pigeon (southern) population (Ayers et al. 1996; EPA 2006). For example, cats were implicated in the decline of squatter pigeon (southern) sub-populations in the Duaringa and Murphy's Creek districts in south-eastern QLD and most declines in sub-populations have occurred in areas where foxes are highly abundant.

9.7.4 Occurrence and Potential Habitat

The squatter pigeon (southern) was not recorded during the field survey program. It is considered to have a moderate likelihood of occurrence within the Project Area, with the presence of suitable habitat indicated by both State mapping and the findings of the field survey program. No ALA records occur within the desktop search extent. The nearest ALA record of the subspecies (dated 2001) occurs approximately 34 km to the south-west of the Project Area within Theodore State Forest. Several records of the subspecies occur within the State Forest area. Six records of the species (i.e. *Geophaps scripta*) occur within 20 km, including one within the Project Area. The record located within the Project Area is sourced from ALA via the Historical Bird Atas managed by BirdLife Australia, is undated and has a 10 km spatial uncertainty. These records may be of the subspecies. For the purposes of this assessment the subspecies is presumed present.

A total of 4,676.7 ha of suitable habitat is mapped within the Project Area including 1,577.2 ha of breeding, 44.6 ha of foraging and 3,055.0 ha of dispersal habitat. Potential breeding and foraging habitat are associated with remnant and regrowth areas of REs 11.3.1, 11.3.17, 11.3.2, 11.3.25, 11.3.3, 11.3.4, 11.3.6, 11.5.2 and 11.5.2a. No land zone 7 communities occur within the Project Area as per the State mapping and field survey findings. Dispersal habitat comprises remaining mapped REs in regrowth and remnant condition, as well as select areas of non-remnant (i.e. those less than 100 m in width which may connect to suitable water sources or areas of breeding or foraging habitat). Perennial watercourses, farm dams and other agricultural water sources and lacustrine wetlands occur commonly in the wider area and may be suitable for the squatter pigeon (southern) despite generally being modified.

The extent of mapped squatter pigeon (southern) habitat within the Project Area is provided below in **Table 9.14**, and the mapped habitat is shown on **Figure 9.7.**

Table 9.14 Habitat Extent for Squatter Pigeon (southern)

Habitat Utilisation	Habitat Definition	Extent within the Project Area (ha)
Breeding	Any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species, on sandy, gravelly or loamy soils with patchy perennial tussock grasses or a mix of perennial tussock grasses and low shrubs and forbs (including but not limited to areas mapped as Queensland land zones 3, 5 or 7) and within 1 km of a permanent or seasonal water source with gently sloping banks.	1,577.2

Habitat Utilisation	Habitat Definition	Extent within the Project Area (ha)
Foraging	Any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species, on sandy, gravelly or loamy soils with patchy perennial tussock grasses or a mix of perennial tussock grasses and low shrubs and forbs (including but not limited to areas mapped as Queensland land zones 3, 5 or 7) and within 3 km of a permanent or seasonal water source with gently sloping banks.	44.6
Dispersal	Any forest or woodland occurring between patches of breeding or foraging habitat that facilitates movement between patches of breeding habitat, foraging habitat and/or water sources, and areas of cleared land with scattered trees less than 100 m wide linking areas of suitable breeding and/or foraging habitat.	3,055.0
	Total	**4,676.6**

9.7.5 Important Populations

'Important populations' of the squatter pigeon (southern) are identified on SPRAT. As the southern boundary of the subspecies distribution is contracting northwards, important populations are identified as all of the relatively small, isolated and sparsely distributed sub-populations occurring south of the Carnarvon Ranges in Central QLD (Department of Climate Change Energy the Environment and Water, 2022). This includes, but is not limited to:

- Populations occurring in the Condamine River catchment and Darling Downs of southern QLD.
- The populations known to occur in the Warwick-Inglewood-Texas region of southern QLD.
- Any populations potentially occurring in northern NSW.

As described above, the Project Area is located within the central part of the subspecies distribution and likely surrounded by suitable habitat especially to the west and south. There is no evidence to indicate that the population present is genetically isolated or subject to contraction. Based on this, any population of individuals utilising the Project Area are not considered an important population.

9.7.6 Habitat Critical to the Survival of the Species

There are no species-specific guidelines for determining habitat critical to the survival of squatter pigeon (southern) and at present no recovery plan exists. However, the *Significant Impact Guidelines 1.1* define habitat critical to the survival of a species or ecological community as areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal.
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators).
- To maintain genetic diversity and long-term evolutionary development. **Or**
- For the reintroduction of populations or recovery of the species or ecological community.

The Project Area occurs within the central extent of the subspecies known distribution, and in this area individuals present are likely to comprise one continuous population that extends north and west. Mapped habitat for this species within the Project Area includes areas considered suitable for breeding, foraging and dispersal, however, it is fragmented. Although these areas may contain the necessary habitat resources, they are subject to ongoing impacts from recognised threatening processes including exotic predators. As such, habitat within the Project Area is not considered to provide refuge for squatter pigeon (southern) and is not considered to contain any unique characteristics or conditions that do not exist in other areas of habitat that occur in the region. In addition, a large extent of habitat for squatter pigeon (southern) occurs in the local area and across the region, some of which is considered better quality. Based on these factors, habitat within the Project Area is not considered critical to the survival of squatter pigeon (southern) and is not considered to play a critical role in the long-term maintenance of the species.

9.7.7 Potential Project Impacts and Key Mitigation Measures

Westside have committed to a cumulative maximum disturbance limit of 1.0 ha for breeding habitat and 1.0 ha for foraging habitat (0.06% and 2.2% of total available habitat respectively). Direct impacts on squatter pigeon (southern) breeding or foraging habitat will be preferentially avoided and minimised, as per the constraints hierarchy.

To ensure patch viability and functionality is maintained at current levels, the siting of Project infrastructure (including wells, gathering infrastructure, tracks and other ancillary infrastructure) within or adjacent to moderate constraint areas (including squatter pigeon (southern) breeding and foraging habitat) will adhere to the following rules:

- Patches that are 0.5 ha or less must be completed avoided by the Project (no direct impacts permitted).
- Patches that are 1.0 ha or less must not be dissected in a way that creates two new patches.
- Direct impacts must not reduce the patch size to less than 0.5 ha OR isolate the patch by more than 50 m to the nearest patch (unless already isolated by more than 50 m).
- Patches >1.0 ha must not be dissected in a way that creates one patch <0.5 ha.

Over the life of the Project, the loss of up to 40.0 ha of dispersal habitat may occur equating to a maximum loss of 1.3% of total available dispersal habitat. However, it should also be noted that this habitat category includes areas of historically cleared land with little to no material habitat features. Direct impacts on dispersal habitat are therefore only temporary in nature as the infrastructure location is rehabilitated immediately following the completion of construction. Through rehabilitation, the area is essentially returned to its previous state and the habitat function is reinstated.

Potential indirect impacts on squatter pigeon (southern) as a result of the Project include:

- increased predation by feral animals including cats and foxes
- increased risk of vehicle or plant collision resulting in mortality.

General mitigation measures are outlined in **Section 8.2.1**. Mitigation measures specific to squatter pigeon (southern) are outlined in **Section 8.2.2** and below:

- Squatter pigeon (southern) individuals, nests and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. Nest locations should be recorded and mapped. The presence and extent of squatter pigeon (southern) habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped).

- Direct impacts to squatter pigeon (southern) breeding habitat and foraging habitat are permitted only to a cumulative maximum disturbance limit of 1.0 ha each. Direct impacts to squatter pigeon (southern) dispersal habitat are permitted only to a cumulative maximum disturbance limit of 40.0 ha. Direct impacts to potential squatter pigeon (southern) habitat will be avoided to the maximum extent possible.

- Where clearing is proposed within squatter pigeon (southern) dispersal habitat, micro-siting efforts will aim to retain mature trees that may provide shelter from aerial predators.

- Where clearing is proposed for areas of squatter pigeon (southern) breeding habitat or foraging habitat, a fauna spotter-catcher must be present. Immediately prior to clearing any squatter pigeon (southern), the fauna spotter-catcher will complete flushing transects to encourage the movement of individuals out of the impact area.

- As the squatter pigeon (southern) nests on the ground and is at high risk of direct mortality, potential nests should also be searched for by the fauna spotter-catcher immediately prior to clearing potential breeding or foraging habitat, with any located demarcated.

- If a squatter pigeon (southern) nest is located and the area is not already identified as breeding habitat, work will temporarily cease. The Protocol will identify the next steps, including but not limited to, re-categorised the area as breeding habitat and determining if predicted impact areas are within the cumulative disturbance limits for squatter pigeon (southern) breeding habitat.

- If direct disturbance to a squatter pigeon (southern) is required, this will be managed under an approved DESI SMP (high-risk). An appropriate exclusion zone as determined by the fauna spotter-catcher will be required around active nests.

- To reduce the potential for crushing of nests or direct mortality, all vehicles and pedestrians will remain within designated access tracks in areas of squatter pigeon (southern) habitat.

- To minimise the chances of collision, in known squatter pigeon (southern) occurrence areas on private property, speed limits will be reduced to 40 km/hr or less and signage will be installed that indicates subspecies presence. It is noted that this subspecies is currently considered a potential occurrence and is not known to the Project Area.

- In the unlikely event that a squatter pigeon (southern) is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days.

- Clearing in and around potential squatter pigeon (southern) suitable water sources (see **Figure 9.7**) will be preferentially avoided. Where clearing is proposed within or adjacent to a squatter pigeon (southern) water source, active erosion and sediment control measures will be implemented to mitigate potential habitat degradation.

- Water extraction activities at any potentially suitable water source for squatter pigeon (southern) will be strictly controlled and monitored to ensure the continuation of the resource. Per waterbody, a single access point will be utilised for water extraction to minimise areas of disturbance and allow potentially occurring individuals to avoid the same area during construction.
- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.

9.7.8 Significant Impact Assessment

The significant impact assessment for this species is presented in **Table 9.15** below. In summary, the assessment found that the Project is **unlikely to result in a significant impact on the squatter pigeon (southern).**

Table 9.15 Significant Impact Assessment – Squatter pigeon (southern)

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Lead to a long-term decrease in the size of an important population of a species	Squatter pigeon (southern) is considered a potential occurrence within the Project Area. As described in the section above, the Project Area is located within the central extent of the subspecies known distribution where the broader population is genetically considered one population and does not intersect with any known important populations. As such, any population of squatter pigeon (southern) present within the Project Area is not considered to comprise an important population. Although much of the squatter pigeon (southern) habitat present within the Project Area is likely to be of low or moderate quality as a result of historical and ongoing disturbance, the Project is committing to a maximum clearance of 1.0 ha of breeding and 1.0 ha of foraging habitat which the species may rely on to fulfil its lifecycle. However, a maximum of 40.0 ha of dispersal habitat may be directly impacted, representing a loss of up to 1.3% of total available dispersal habitat. The species dispersal habitat requirements are broad and as such this type of habitat is widely available within the Project Area and region. Additional ecology field surveys will be undertaken in any areas proposed for development as part of the Project to ensure locations containing the species or its habitat are verified. Extraction activities impacting water sources potentially utilised by the species will also be strictly monitored and controlled to ensure resource continuation and minimal disturbance around the bank. This will include defined erosion and sediment controls as necessary. As the subspecies is predominantly ground-dwelling and known to frequent tracks, there is a risk of mortality during construction as a result of vehicle strike. To manage this risk, speed limits will be strictly enforced (in private areas) and pre-clearance surveys will include flushing for the subspecies in areas of habitat to be cleared. In breeding areas, it will be ensured that vehicles and pedestrians remain on designated tracks to avoid damage to nests. Other potential indirect impacts on the species including habitat degradation via weed and pest incursion will be actively managed via Project management plans including but not limited to the SSMP and EMP. As an important population is not considered present within the Project Area, the Project is highly unlikely to lead to a long-term decrease.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Reduce the area of occupancy of an important population	The Project Area does not support an important population of squatter pigeon (southern). The squatter pigeon (southern) occurs across a large portion of eastern QLD. Its area of occupancy was estimated to be 10,000 km^2 (1,000,000 ha) in 2000. However, it is noted that this estimate may be potentially overstated given the low resolution in the mapping methodology used by the Commonwealth (2 km x 2 km grid). Direct impacts to breeding and foraging habitat are particularly limited (maximum 1.0 ha for each). As detailed above, the population of squatter pigeon (southern) within the Project Area is not considered important. Therefore, the Project is unlikely to reduce the area of occupancy of any population including an important population.	Unlikely
Fragment an existing important population into two or more populations	The squatter pigeon (southern) is considered highly mobile and is frequently recorded in highly disturbed and cleared areas, highlighting the subspecies' ability to utilise fragmented landscapes. The siting of infrastructure will maximise previously cleared areas as well as existing breaks in vegetation, to ensure clearing will not exacerbate habitat fragmentation of dispersal habitat. Trenches left open during construction may create a temporary barrier to movement. As such, other management measures proposed for the species include the regular (each morning and night) checking of open trenches and the implementation of trench ladders, ramps, sticks, ropes and moist hessian sacks to aid in an escape from said trenches. Nonetheless, the population potentially present within the Project Area is not considered an important population. As such, the Project is unlikely to fragment an existing important population into two or more populations.	Unlikely
Adversely affect habitat critical to the survival of a species	Habitat within the Project Area is not considered critical to the survival of the subspecies as it is unlikely to provide a refuge, is average in quality, and subject to ongoing impacts from recognised threatening processes. Potential habitat for squatter pigeon (southern) is likely to occur extensively in the wider local area and potentially be of higher quality. Westside have committed to a cumulative maximum disturbance limit of 1.0 ha for breeding habitat, 1.0 ha for foraging habitat and 40.0 ha for dispersal habitat. Potential indirect impacts will be actively managed via the Project management plans including but not limited to the SSMP and EMP. As such, it is considered unlikely the Project will adversely affect habitat critical to the survival of the species.	Unlikely
Disrupt the breeding cycle of an important population	Impacts to breeding habitat will be prioritised for avoidance by the Project and the population potentially present within the Project Area is not considered an important population. Pre-clearance surveys undertaken by fauna spotter-catchers will identify and demarcate nests, and if present the area containing the nest will be categorised as breeding habitat and will be preferentially avoided, as per the constraints hierarchy. A maximum of 1.0 ha of potential breeding habitat may be impacted by the Project. To further avoid potential breeding disruption, movement within the Project Area will only be via approved access tracks with enforced speed limits. As such, it is unlikely the Project will disrupt the breeding cycle of an important population.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	As described above, vegetation clearing required for construction of the Project will result in direct impacts to a maximum of 1.0 ha of suitable breeding habitat, 1.0 ha of suitable foraging habitat and 40.0 ha of suitable dispersal habitat. The quantum of breeding, foraging and dispersal habitat that will remain following construction is expected to be sufficient to support any population present. The subspecies is known to utilise fragmented landscapes and important habitat resources (suitable water sources) will be maintained. Potential indirect impacts on the species including habitat degradation via weed and pest incursion will be actively managed via the Project management plans. Therefore, the Project is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Unlikely
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Predation and habitat degradation constitute two of the current main threats to this subspecies. Invasive species including the fox (*Vulpes vulpes**) and cat (*Felis catus**) are known predators to the squatter pigeon, with invasive weeds such as buffel grass (*Cenchrus ciliaris**) causing habitat degradation. As the Project Area is largely cleared for agricultural purposes, it is considered likely that many areas already act as conduits for pest movement in the landscape and invasive species are likely common. The Project will employ best practice control methods for invasive pests including responsible waste management to minimise the attraction of predatory fauna/pest species, prohibiting domestic animals within the Project Area, and the implementation of a weed, pest and biosecurity management plan. Based on this, it is unlikely the Project will result in invasive species that are harmful to the squatter pigeon (southern) becoming established.	Unlikely
Introduce disease that may cause the species to decline	There are no known diseases affecting the subspecies. Nonetheless, the Project will follow best practice biosecurity protocols during both construction and operation; therefore, introduction of a disease is unlikely.	Unlikely
Interfere substantially with the recovery of the species	There is no recovery plan currently in place for the subspecies nor is one considered required. As per SPRAT, the following recovery actions have been recommended based on the approved conservation advice: • Identify sub-populations of high conservation priority, especially in the southern part of the squatter pigeon's (southern) range. • Protect and rehabilitate areas of vegetation that support important sub-populations. • Protect sub-populations of the listed subspecies through the development of covenants, conservation agreements or inclusion in reserve tenure. • Develop and implement a stock management plan for key sites. • Develop and implement a management plan, or nominate an existing plan to be implemented, for the control and eradication of feral herbivores in areas inhabited by the squatter pigeon (southern). • Raise awareness of the squatter pigeon (southern) within the local community, particularly among land managers. The Project is highly unlikely to impede any of the above actions. Although clearing will occur within areas of suitable habitat, the majority of the area to be impacted comprises habitat suitable for dispersal only. Construction of the Project is unlikely to change the subspecies utilisation of the Project Area or limit its success in the region. Therefore, the Project is unlikely to interfere with the recovery of the subspecies.	Unlikely

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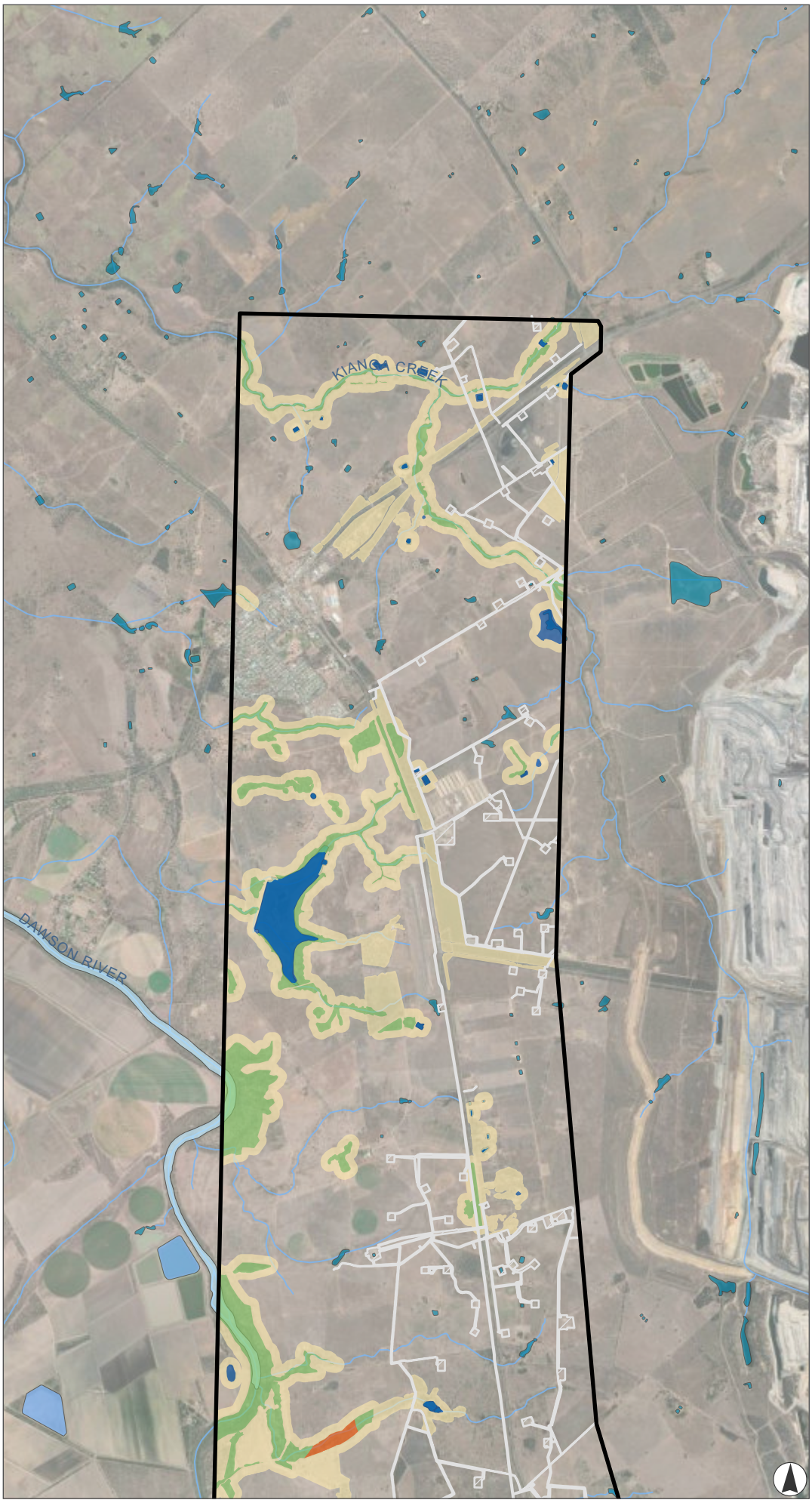


FIGURE 9.7A

Squatter pigeon (southern) *(Geophaps scripta scripta)* Habitat and Records

Legend

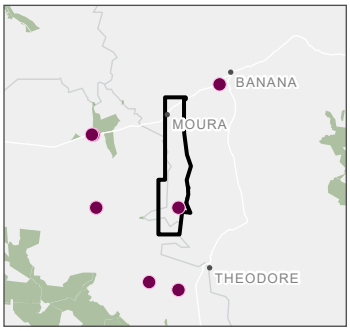
- ALA Records of Squatter Pigeon (southern)
- Watercourse
- Project Area
- Existing Westside infrastructure

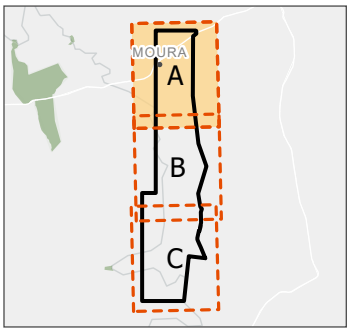
Squatter Pigeon (southern) habitat mapping

- Breeding
- Dispersal
- Foraging
- Potential water source

DoR Reservoirs

- Flood Irrigation Storage
- Rural Water Storage
- Town Water Storage





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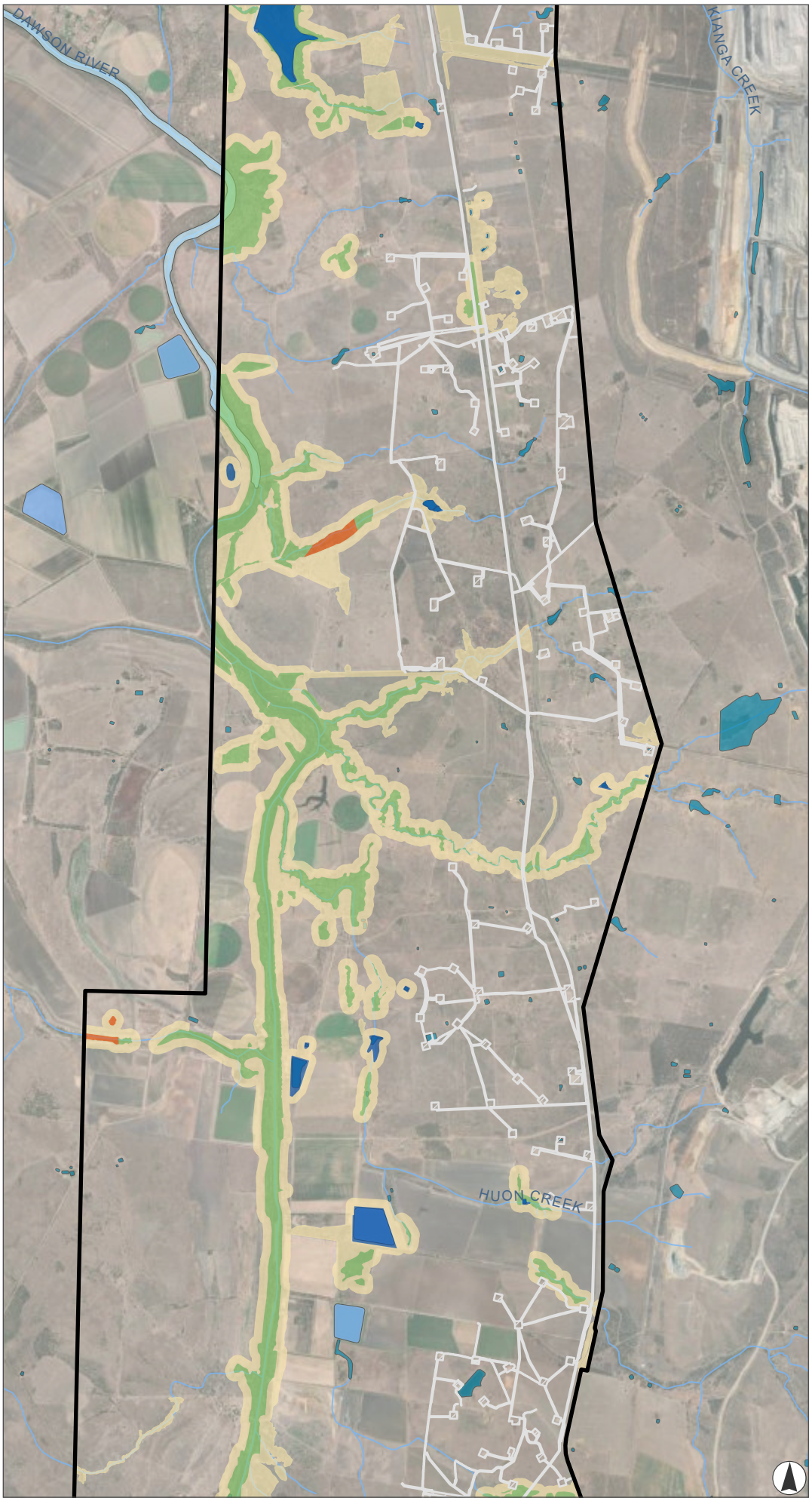


FIGURE 9.7B

Squatter pigeon (southern) *(Geophaps scripta scripta)* Habitat and Records

Legend

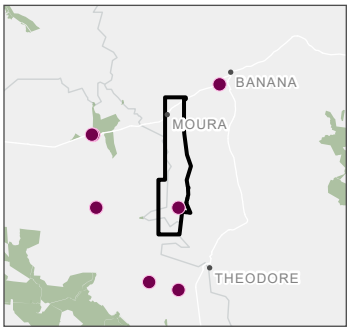
- ALA Records of Squatter Pigeon (southern)
- Watercourse
- Project Area
- Existing Westside infrastructure

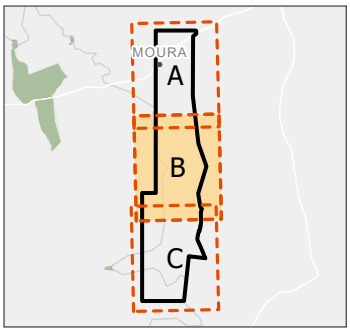
Squatter Pigeon (southern) habitat mapping

- Breeding
- Dispersal
- Foraging
- Potential water source

DoR Reservoirs

- Flood Irrigation Storage
- Rural Water Storage
- Town Water Storage





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GDA2020 MGA Zone 55

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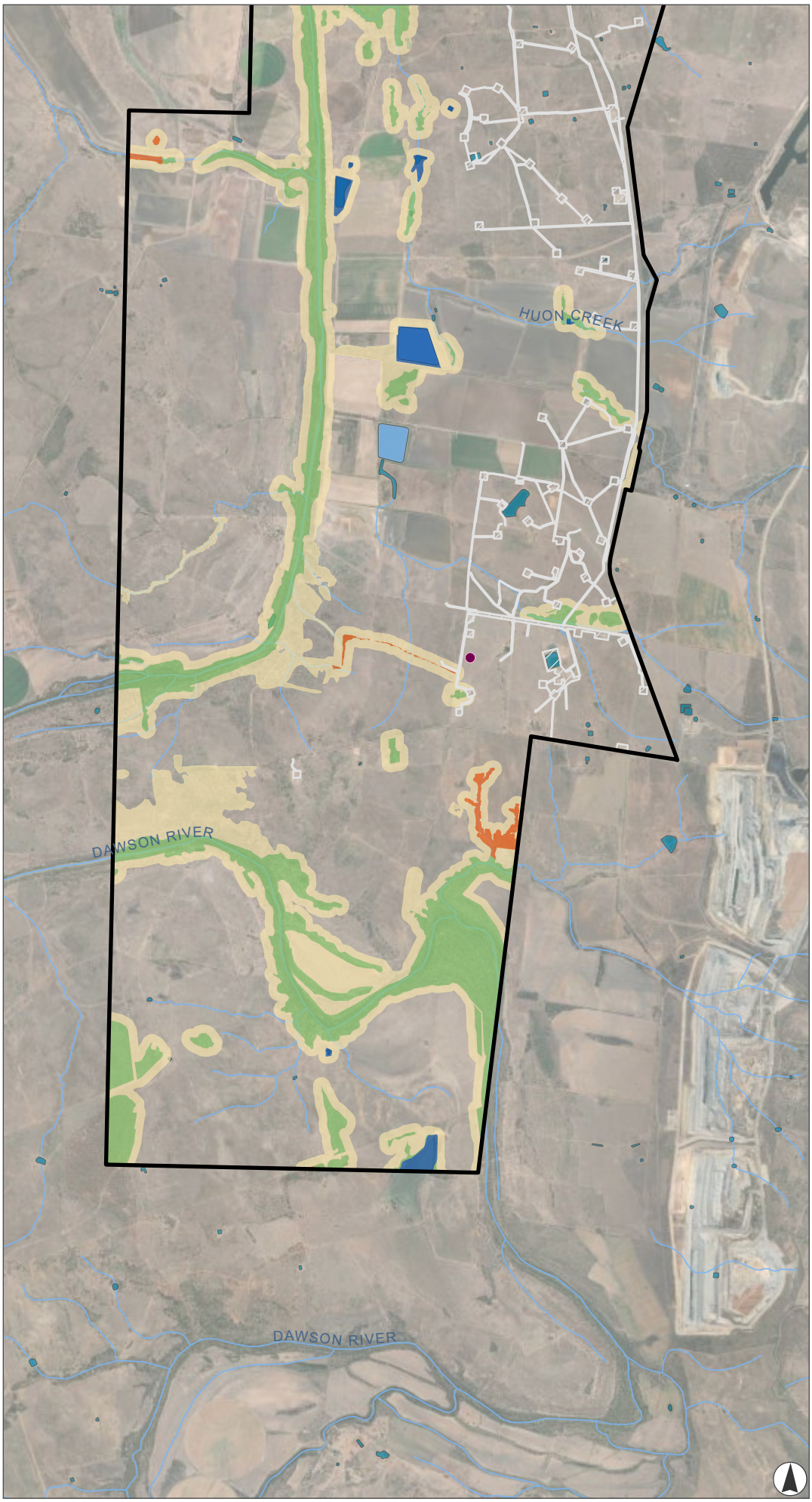


FIGURE 9.7C

Squatter pigeon (southern) *(Geophaps scripta scripta)* Habitat and Records

Legend

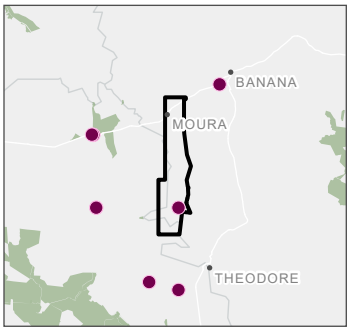
- ALA Records of Squatter Pigeon (southern)
- Watercourse
- Project Area
- Existing Westside infrastructure

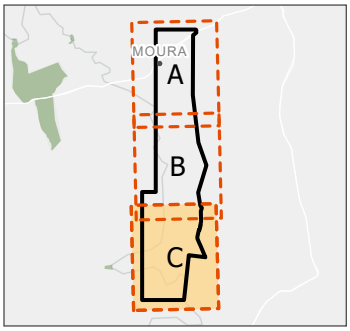
Squatter Pigeon (southern) habitat mapping

- Breeding
- Dispersal
- Foraging
- Potential water source

DoR Reservoirs

- Flood Irrigation Storage
- Rural Water Storage
- Town Water Storage





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9.8 Australian painted snipe (*Rostratula australis*)

9.8.1 Status under the EPBC Act

The Australian painted snipe is listed as Endangered under the EPBC Act.

9.8.2 Distribution and Habitat Requirements

The Australian painted snipe has been recorded at wetlands in all states of Australia. It has a large distribution that covers all of eastern mainland Australia, most of the Northern Territory, eastern South Australia and most coastal areas of Western Australia. However, it is most common in eastern mainland Australia, where it has been recorded at scattered locations. The Murray–Darling Basin, particularly the Riverina region of Victoria and NSW, appears to have been a stronghold for the species (Blakers et al. 1984 in Department of Climate Change, Energy, the Environment and Water, 2022b). Smaller historical and/or present concentrations include the Channel Country in QLD and South Australia, the Capricornia coast of central QLD, and south-eastern South Australia (along with adjacent parts of Victoria).

Due to the highly secretive behaviour and concealing habitats commonly used, the specific habitat requirements of the Australian Painted Snipe are much less well known than for most other Australian waterbirds (Department of Climate Change, Energy, the Environment and Water, 2022b). The species occurs in shallow freshwater (occasionally brackish) wetlands, both ephemeral and permanent, such as lakes, swamps, claypans and inundated or waterlogged grassland/saltmarsh with areas of bare mud and mixed heights of low vegetation. In the inland and northern extent of its distribution, gilgai wetland surfaces are favoured, notably for nest sites.

Dominant vegetation in occupied wetlands can include grass, sedge, nardoo (*Marsilea drummondii*), rushes and reeds, low samphire (*Tecticornia* spp.) shrublands, and open shrublands of lignum (*Duma florulenta*) and river cooba (*Acacia stenophylla*). Fallen or washed-up timber also provides concealing opportunities for the species. Modified habitats such as low-lying woodlands converted to grazing pasture, rice farms, sewage farms, dams, bores and irrigation schemes are also used; however, the species does not necessarily breed in such habitats (Department of Climate Change, Energy, the Environment and Water, 2022b).

This species is mainly crepuscular (active at dawn and dusk), preferring to sit or stand quietly under cover of grass, reeds or other dense cover during day, becoming more active at dawn, dusk and during night. They generally remain in dense cover when feeding, although may forage over nearby mudflats and other open areas such as ploughed land or grassland (Marchant and Higgins 1993). Feeding behaviour is likely to be different in wetlands where Australian Painted Snipe are present for breeding compared to sites that may act as refuges or stop-over sites, e.g. sewage ponds, water storages. Behaviour is likely to change depending on the height and density of wetland vegetation.

The Australian painted snipe is considered to occur in a single, contiguous breeding population. Breeding records exist, many from the last two decades, across the range of occurrence including some from wetlands far beyond the Murray–Darling Basin (many records in coastal Queensland; some from the Lake Eyre Basin, Barkly Tableland and north-western Australia).

Movement patterns are poorly known for this species. They are possibly dispersive or migratory (Lowe 1963 in Department of Climate Change, Energy, the Environment and Water, 2022b), but might be best described as nomadic (movements with no fixed spatial or temporal pattern). Movements have been attributed to local conditions: to flooded areas; from drying to permanent wetlands; away from areas affected by drought. Some areas may have regular seasonal influxes, e.g. spring-summer or summer visitor to Cunnamulla and Minden in Queensland, Mossgiel in south-western NSW, and Victoria (Marchant and Higgins 1993).

9.8.3 Threats

The primary identified threat to the Australian painted snipe is the loss, fragmentation, and degradation of wetlands, through drainage and the diversion of water for agriculture and reservoirs. *The National Recovery Plan for the Australian Painted Snipe* (*Rostratula australis*) (Department of Climate Change, Energy, the Environment and Water, 2022b) notes that loss of breeding habitat has largely been attributed to: (1) the reduced frequency of flooding in previously suitable habitat, exacerbated by a loss of fresh water to irrigation and other diversions; (2) water levels being stabilised in remaining wetlands so that water becomes too deep, or continuous reed beds develop; and (3) loss of wetland vegetation in floodplain wetlands due to increased cropping, and possibly through altered fire regimes at some sites.

Other identified threats include:

- grazing and the associated trampling of wetland vegetation, nutrient enrichment, and disturbance to substrate by livestock
- replacement of native wetland vegetation by invasive weeds
- predation by invasive animals (e.g. nest predation by foxes (*Vulpes vulpes*) or cats (*Felis catus*))
- prolonged periods of drought and reduction in rainfall and runoff associated with climate change.

9.8.4 Occurrence and Potential Habitat

The Australian painted snipe was not recorded during the field survey program. It is conservatively considered to have a moderate likelihood of occurrence within the Project Area, primarily due to the presence of suitable habitat which is supported by both State mapping and the findings of the field survey program.

The Project Area occurs within the species 'may occur' distribution extent as per SPRAT. Areas of 'likely to occur' distribution occur to the south and to the east. No ALA records occur within the desktop search extent. The nearest ALA record (dated 2000) occurs approximately 35 km to the south-east near the Dawson River. The record has been sourced from WildNet (Queensland Wildlife Data), has 999 m spatial uncertainty and is associated with the 'Lagoona' locality. Two additional records occur further south; the next closest is undated and has been generalised by 10 km while the third is an OZCAM record from 1977.

A review of eBird and the species' 'range map' confirms the species rarity in the region, with no areas of presence identified in the wider region surrounding the Project Area. The nearest area of occurrence as per the map occurs >100 km east near the township of Rockhampton. This suggests the species' presence within the Project Area is likely to be sporadic and opportunistic in nature, with periods of absence potentially common. Nonetheless, for the purposes of this assessment the species is conservatively presumed present.

The Project Area may provide habitat for the species during periods of high rainfall, comprising modified claypans that support gilgai formations and farm dams. Native ground-layer vegetation is rare at farm dams, but does occur occasionally within gilgai, fringing the perimeter in a loose band of individual plants that are otherwise surrounded by exotic grass. Farm dams were commonly found to have margins dominated by bare ground that were heavily impacted by cattle pugging. Broadly, shelter opportunities for the species are primarily limited to areas of exotic grass that have not been grazed recently. When inundated, potential habitat within the Project Area is conservatively considered suitable for breeding, foraging and dispersal purposes, noting that the species' specific habitat requirements are not well understood. The presence of suitable habitat is however dependent on climatic conditions and is thus temporary. Given this, the brownfield nature of the site and the lack of dense and tall wetland vegetation cover, habitat likely provides a 'stop-over' site, unsuitable for refuge.

Significant historical modification of the landscape in which the Project Area exists has occurred for agriculture and mining, including broadscale clearing and changes to the hydrological regime. Preferred shallow wetland habitat is absent from the Project Area including lakes and swamps. Identified potential habitat within the Project Area is used actively for agricultural purposes including cattle grazing and cropping, and as described above is largely temporary. Use of these areas by cattle and other exotic fauna (including those that may actively prey upon the Australian painted snipe) during the dry season likely intensifies as water becomes limited in the landscape, leading to increased pressures. It is considered likely that the combination of compounding threatening processes, at times renders the habitat unsuitable.

The species is highly mobile and movement patterns are thought to be nomadic, indicating that habitats may not be utilised consistently over space and time. Potential habitat within the Project Area is unlikely to be preferentially used by the species, as when it is present (i.e. during the wet season), habitat availability across the species' core range is at its greatest. Noting this, and the absence of records in the region, it is considered likely that only a very small number of dispersing individuals may occupy the Project Area at any time, with habitat being of low relative importance to the species.

The extent of mapped Australian painted snipe habitat within the Project Area is provided below in **Table 9.16**, and the mapped habitat is shown on **Figure 9.8**.

Table 9.16 Habitat Extent for Australian Painted Snipe

Habitat Utilisation	Habitat Definition	Extent within the Project Area (ha)
Seasonal breeding, foraging and dispersal	Shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use other 'moist areas' such as inundated or waterlogged grasslands (including those that support gilgai), saltmarsh, dams, rice crops, sewage farms and bore drains. Dominant vegetation in occupied wetlands may include one of more of these elements: grass (e.g. canegrass *Eragrostis australasica*), sedge, and nardoo (*Marsilea*), in sward or tussock form; clumps of rushes or reeds; samphire dwarf shrubland; and open-shrubland of lignum (*Duma* spp.), river cooba (belalie) *Acacia stenophylla*.	1,354.7
	Total	**1,354.7**

9.8.5 Important Populations

As this species is listed as Endangered under the EPBC Act, 'important populations' do not apply.

9.8.6 Habitat Critical to the Survival of the Species

The *National Recovery Plan for the Australian Painted Snipe* (*Rostratula australis*) (Department of Climate Change, Energy, the Environment and Water, 2022b) provides guidance on what habitat should be considered habitat critical to the survival of the species. Any categorisation of habitat critical to survival must acknowledge that the species exists in a mosaic of wetland habitats, with carrying capacity fluctuating with seasonal or episodic floods and effects of threats (Department of Climate Change, Energy, the Environment and Water, 2022b). The species habitat is also influenced by biophysical environments that varies across the species range. A such, there is no one definition, but a definition should be delivered at a bioregional scale to account for species specific requirements of that region.

As a guide, habitat critical to the survival of the Australian painted snipe can be considered to include (Department of Climate Change, Energy, the Environment and Water, 2022b):

- Any natural wetland habitat where the species is known or likely to occur (especially with suitable breeding habitat) within the indicative distribution map (see Figure 1 of Department of Climate Change, Energy, the Environment and Water, (2022c).
- Any location outside the above area that may be periodically occupied by Australian painted snipe when conditions are favourable.

It is documented in the recovery plan that "Gilgai micro relief, comprising extensive systems of small mounds (e.g. 1 to 3 m in diameter) and hollows (e.g. up to 0.5 m deep), is especially suitable" (Department of Climate Change, Energy, the Environment and Water, 2022b).

Based on the above definitions, habitat within the Project Area has been conservatively determined to comprise habitat critical to the survival of the species, despite its high levels of historical modification and ongoing disturbance. However, as described in Section 9.8.4, the relative importance of potential habitat within the Project Area to the species is considered low.

9.8.7 Potential Project Impacts and Key Mitigation Measures

Over the life of the Project, Westside have committed to a cumulative maximum disturbance of 6.0 ha of breeding, foraging and dispersal habitat. Direct impacts on Australian painted snipe habitat will be preferably avoided and minimised, as per the constraints hierarchy (**Section 8.1**).

To ensure patch viability and functionality is maintained at current levels, the siting of Project infrastructure (including wells, gathering infrastructure, tracks and other ancillary infrastructure) within or adjacent to moderate constraint areas (including Australian painted snipe habitat) will adhere to the following rules:

- Patches that are 0.5 ha or less must be completed avoided by the Project (no direct impacts permitted).
- Patches that are 1.0 ha or less must not be dissected in a way that creates two new patches.
- Direct impacts must not reduce the patch size to less than 0.5 ha OR isolate the patch by more than 50 m to the nearest patch (unless already isolated by more than 50 m).
- Patches >1.0 ha must not be dissected in a way that creates one patch <0.5 ha.

Potential indirect impacts on the Australian painted snipe as a result of the Project include:

- Soil exposure resulting in an increased risk of erosion and sedimentation of water bodies, reducing water quality and degrading aquatic habitats.
- Increased risk of contamination associated with activities such as refuelling or storage of chemicals.
- Temporary changes in hydrology from installation of infrastructure creating a barrier to surface flow and increasing stormwater run-off.
- Removal of water from existing constructed wetlands leading to changes in hydrology / habitat extent and water quality. Increased activity at these locations resulting in avoidance and potentially altered foraging and breeding behaviour.
- Periodic burst of elevated noise levels may startle and disorientate individuals within proximity.
- Increased pest levels, notably those which may prey upon this species.

General mitigation measures are outlined in **Section 8.2.1**. Mitigation measures specific to the Australian painted snipe are outlined in **Section 8.2.2** and below:

- Australian painted snipe individuals, nests and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. Nest locations will be recorded and mapped. The presence and extent of Australian painted snipe habitat within a minimum of 30 m of the infrastructure location should be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped).
- Direct impacts to Australian painted snipe seasonal breeding, foraging and dispersal habitat are permitted only to a cumulative maximum disturbance limit of 6.0 ha. Direct impacts to potential Australian painted snipe habitat will be avoided to the maximum extent possible.

- Where clearing is proposed for areas of Australian painted snipe habitat, a fauna spotter-catcher must be present. Immediately prior to clearing any Australian painted snipe habitat, the fauna spotter-catcher will complete flushing transects to encourage the movement of individuals out of the impact area.
- As the Australian painted snipe nests on the ground and is at high risk of direct mortality, potential nests should also be searched for by the fauna spotter-catcher immediately prior to clearing potential habitat, with any located demarcated. Construction activities will not be permitted within 100 m of any active nest.
- If direct disturbance to an Australian painted snipe nest is required, this will be managed under an approved DESI SMP (high-risk). An appropriate exclusion zone as determined by the fauna spotter-catcher will be required around active nests, but will be no less than 100 m.
- To reduce the potential for crushing of nests or direct mortality, all vehicles and pedestrians will remain within designated access tracks in areas of Australian painted snipe habitat.
- To minimise the chances of collision, in known Australian painted snipe occurrence areas on private property, speed limits will be reduced to 40 km/hr or less and signage will be installed that indicates subspecies presence. It is noted that the species is currently considered a potential occurrence and is not known to the Project Area.
- In the unlikely event that an Australian painted snipe is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days.
- Clearing in and around Australian painted snipe habitat will be preferentially avoided. Where clearing is proposed within or adjacent to Australian painted snipe habitat, active erosion and sediment control measures will be implemented to mitigate potential habitat degradation.
- Water extraction activities at any water source potentially suitable for Australian painted snipe will be strictly controlled and monitored to ensure the continuation of the resource. Per waterbody, a single access point will be utilised for water extraction to minimise areas of disturbance and allow potentially occurring individuals to avoid the same area during construction.
- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.

9.8.8 Significant Impact Assessment

The significant impact assessment for this species is presented in **Table 9.17** below. In summary, the assessment found that the Project is **unlikely to result in a significant impact on the Australian painted snipe.**

Table 9.17 Significant Impact Assessment – Australian painted snipe

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Lead to a long-term decrease in the size of a population	The Australian painted snipe is inferred to have undergone a severe decline in the number of mature individuals since the 1950s and specifically over the last three generations (~26 years) due to the loss and degradation of its wetland habitat. This species was not recorded within the Project Area during field surveys and records of the species in the region are rare. Some suitable habitat is present within the Project Area comprising farm dams and modified clay plans with gilgai. Although habitat is highly modified and disturbed, it is considered potentially suitable for seasonal breeding, foraging and dispersal purposes. The Project Area occurs within the 'potential' distribution of the species according to the SPRAT, some distance from known areas of species concentrations such as the Capricorn Coast and the Murry Darling Basin. As such only a small number of individuals at any one time are expected to utilise potential habitat. Moreover, habitat within the Project Area is seasonally dependent (with the exception of larger farm dams) and thus temporary in nature. Identified Project Area habitat is likely to be most suitable for the species at the peak of the wet season. However, during this time habitat in the region is also likely to be widely available, providing any individuals that may be in the region a range of options. As described in **Section 9.8.4**, habitat within the Project Area is highly unlikely to be preferred. A maximum of 6.0 ha of potential breeding, foraging and dispersal habitat (gilgai and/or farm dams) may be directly impacted via vegetation clearing in the waterbody edges. Indirect impacts include increased activity and noise, increased weed incursion, erosion and sedimentation at waterbodies and potential changes in hydrology due to water extraction activities. However, these will be temporary and as the Project will be constructed in phases, impacts will be localised. Furthermore, indirect impacts on the species and it's habitat will be actively managed via Project management plans including the EMP and SSMP. As per Westside's Permit to Disturb process, field scouts will be completed by qualified ecologists prior to any disturbance to ensure suitable habitat is identified and the species is surveyed for (searches for individuals and any potential nests). Therefore, no Project related activities are considered likely to lead to a long-term decrease in the size of a population.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Reduce the area of occupancy of the species	This species' area of occupancy was estimated by (Garnett, Szabo and Dutson, 2011) to be 2,000 km^2 and decreasing. The area of occupancy has undoubtedly declined as approximately 50% of wetlands in Australia have been removed since European settlement. The Project Area does not contain the species preferred shallow terrestrial wetland habitat. However, farm dams and areas of gilgai within the Project Area are present and are conservatively considered potentially suitable for seasonal breeding, foraging and dispersal. A maximum of 6.0 ha of suitable habitat will be directly impacted over the life of the Project. However, the Project will be staged ensuring direct impacts are limited to a small discrete portion of the Project Area at any given time. Water extraction activities will be strictly controlled and monitored in liaison with the landholder to ensure habitat is retained and the condition unchanged. No waterbodies will be completed drained. This species is nomadic and is likely to readily move to areas of suitable habitat at any time. The Project Area does not occur at the limit of the species distribution nor near a known concentration of the species. As such the Project is unlikely to reduce the area of occupancy of the species.	Unlikely
Fragment an existing population into two or more populations	No existing population is known from the Project Area and it is likely that utilisation would be intermittent and opportunistic for transitory individuals during optimal conditions (after rain events). The species is also highly mobile and the Project will not result in the creation of barriers to movement within or between habitat for the species. As construction of the Project will occur in phases, direct and indirect impacts at one time will be localised to only a small area within the Project Area. This will allow potentially present individuals to relocate to other areas of suitable habitat within the Project Area or outside. Therefore, it is unlikely the Project will fragment an existing population into two or more populations.	Unlikely
Adversely affect habitat critical to the survival of a species	As the Project Area contains areas potentially suitable for seasonal foraging and breeding, these areas (farm dams and the gilgai) are conservatively considered to meet the definition of habitat critical to the survival of the species. The species is highly secretive and requires shelter, which typically comprises low wetland vegetation including grass, sedges, rushes or reeds. As described in Section 9.8.4, identified habitat is predominantly non-remnant vegetation that is dominated by exotic grass with very limited native vegetation. Use of these areas by cattle and other exotic fauna (including those that may actively prey upon the Australian painted snipe) during the dry season likely intensifies as water becomes limited in the landscape, leading to increased pressures. Based on the findings of the field survey, shelter opportunities for the species within Project Area habitat are primarily limited to areas of exotic grass that have not been grazed recently. Given this, the brownfield nature of the site and the lack of dense and tall wetland vegetation cover, habitat is considered to provide a 'stop-over' site, unsuitable for longer term refuge.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
	The species is highly mobile and movement patterns are thought to be nomadic, indicating that habitats may not be utilised consistently over space and time. Although it meets the definition of habitat critical to the survival of the species, habitat within the Project Area is unlikely to be preferentially used by the species, as when it is present (i.e. during the wet season), habitat availability across the species' core range is at its greatest. Noting this, and the absence of records in the region, it is considered likely that only a very small number of dispersing individuals may occupy the Project Area at any time, with habitat being of low relative importance to the species. A maximum of 6.0 ha of habitat critical to the survival of the species may be lost over the life of the Project. The overall loss of this habitat will lead to a 0.4% reduction in available habitat, which is likely to be inconsequential to the species given potential habitat is likely widely available in the wider area during the wet season (extensive areas of gilgai visible on aerial imagery including north and west of the Project Area). As the Project will be constructed in phases, both direct and indirect impacts will be localised to a small portion of the Project Area. Water extraction activities will be strictly controlled and monitored in liaison with the landholder to ensure habitat continuation. Furthermore, indirect impacts on the species and its habitat will be actively managed via Project management plans including the EMP and SSMP. Based on the above, the Project is considered unlikely to adversely impact habitat critical to the survival of the Australian Painted Snipe.	
Disrupt the breeding cycle of a population	The Australian painted snipe may breed at any time throughout the year in response to favourable wetland conditions, rather than during a particular season. Although the Project Area contains potentially suitable breeding habitat, due to its disturbed nature and lack of preferred dense shelter vegetation, it is unlikely provide breeding habitat during the dry season (no areas with vegetative islands and flooded fringing vegetation). Under ideal climatic conditions (following an above average wet season), water availability in the landscape will be high and the area of available of Australian painted snipe breeding habitat may be substantial. As construction of the Project will occur in phases, direct and indirect impacts at one time will be localised to only a small area within the Project Area. The remainder of the Project Area will still provide suitable breeding habitat for the species, for any individuals looking to build a nest. If an active Australian painted snipe nest is discovered within the zone to be impacted, the active breeding place will be managed under a DESI SMP (high-risk), including an exclusion zone around the nest (minimum 100 m wide). As such, the Project is unlikely to disrupt the breeding cycle of a population.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No existing population is known from the Project Area and it is likely that utilisation would be sporadic and opportunistic for transitory individuals during optimal conditions (after rain events). The species is also highly mobile and may utilise other habitat areas in the local landscape as climatic conditions or environmental pressures change. Direct impacts are anticipated to occur to some areas of seasonal breeding, foraging and dispersal habitat over the life of the Project (a maximum of 6.0 ha).	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
	Water extraction activities will be strictly controlled and monitored in liaison with the landholder to ensure habitat continuation. Per waterbody, a single access point will be utilised for water extraction to minimise areas of disturbance and allow potentially occurring individuals to avoid the same area during construction. Measures targeted to erosion and sediment control, potential contamination and pests will also be implemented during construction to ensure indirect impacts that may lead to habitat degradation or increased threat levels to the species are managed. As such the Project is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of the habitat to the extent that the species is likely to decline.	
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The replacement of endemic wetland vegetation by invasive, noxious weeds has been identified as a threat to the Australian painted snipe. However, the Project is unlikely to exacerbate invasive species beyond current levels. Weed and pest management controls will be developed to mitigate and manage the potential spread of pest flora and fauna species.	Unlikely
Introduce disease that may cause the species to decline, or	Disease has not been identified as a threat to the Australia painted snipe. Weed and pest management controls for the Project will ensure best practice site hygiene measures.	Unlikely
Interfere with the recovery of the species.	The *National Recovery Plan for the Australian Painted Snipe* (Department of Climate Change, Energy, the Environment and Water, 2022b) lists the following objectives to achieve the aim of a positive population trend by 2032: • Manage and protect known Australian Painted Snipe habitat at the landscape scale. • Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions. • Reduce, or eliminate threats at breeding and non-breeding habitats. • Undertake research to improve knowledge of the habitat requirements, biology and behaviour of Australian Painted Snipe. • Engage community stakeholders to improve awareness of the conservation of Australian Painted Snipe. • Coordinate, review and report on recovery progress. The Australian painted snipe is not known to occur within the Project Area or surrounding region. The Project Area occurs within the 'may occur' extent of the species distribution on SPRAT. As the species is nomadic, predicting utilisation of any area is difficult. However, the Project Area does not occur near any known concentration of the species and records in the region are rare. Furthermore, potential habitat occurs within a brownfield location where it is subject to a variety of ongoing threatening processes. On this basis, the species is likely to only utilise the habitat during the wet season on a transitory and temporary basis. Based on the above, the Project is unlikely to interfere with the recovery of the species.	Unlikely

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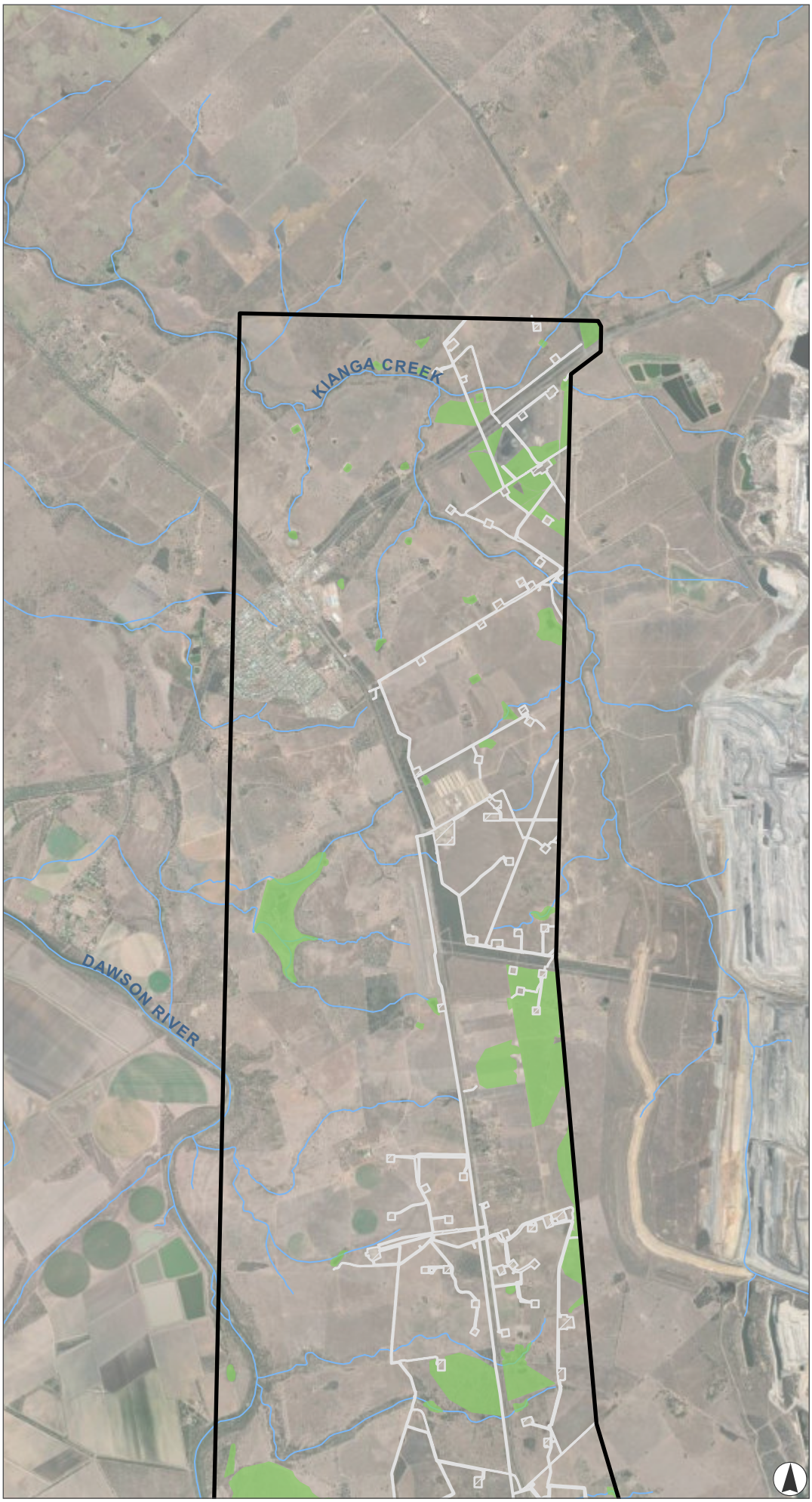


FIGURE 9.8A

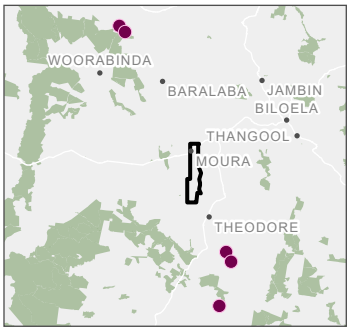
Australian painted snipe *(Rostratula australis)* Habitat and Records

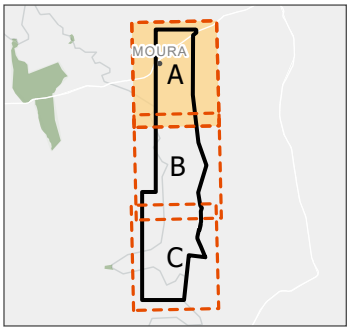
Legend

- ALA Records of Australian Painted Snipe
- Watercourse
- Project Area
- Existing Westside infrastructure

Australian Painted Snipe Habitat

- Seasonal breeding, foraging and dispersal





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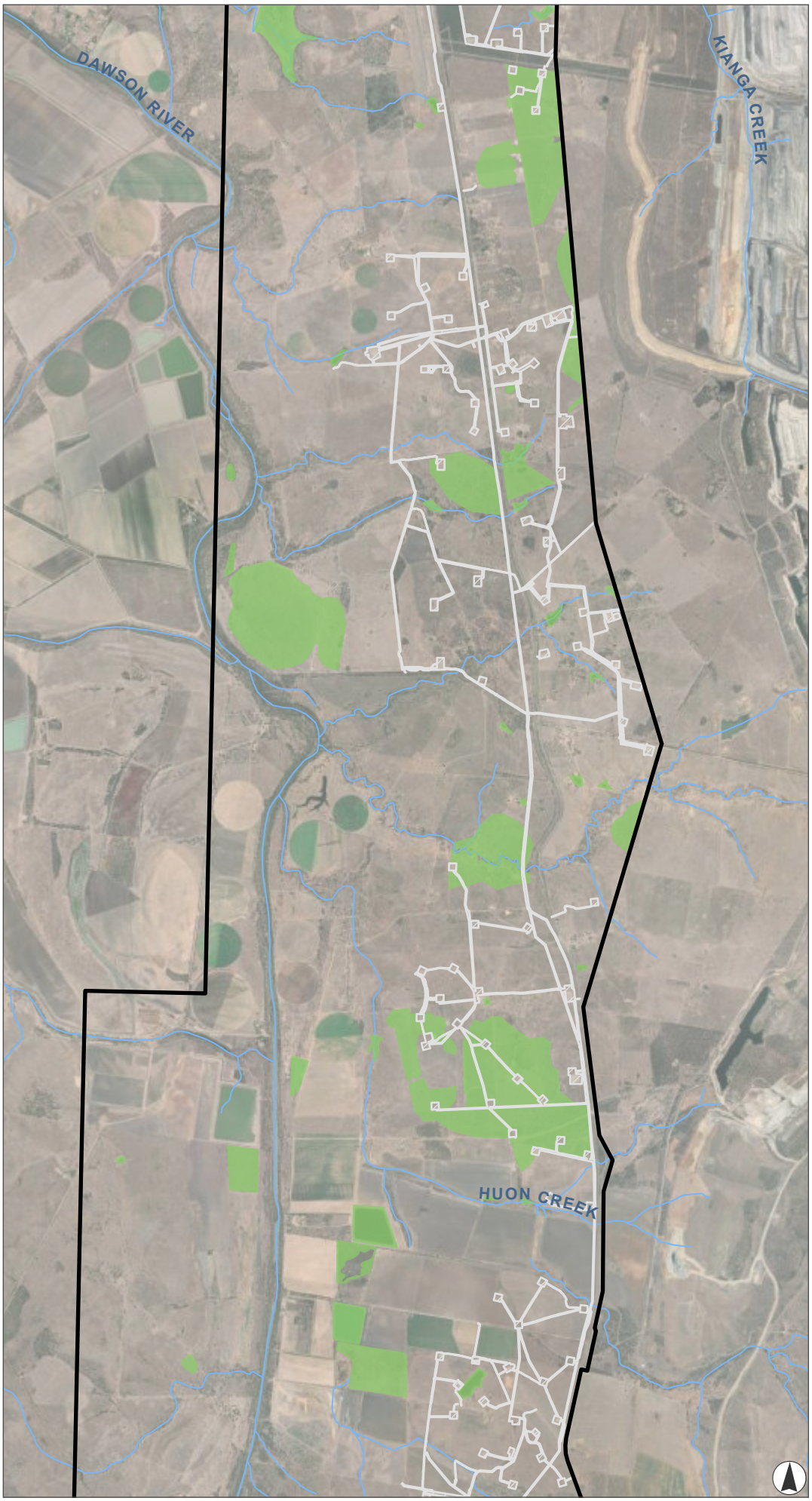


FIGURE 9.8B

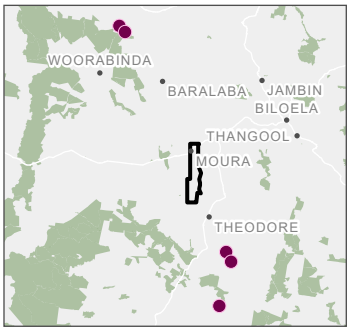
Australian painted snipe *(Rostratula australis)* Habitat and Records

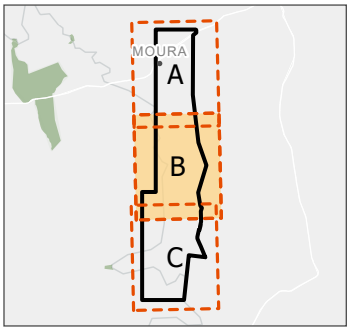
Legend

- ALA Records of Australian Painted Snipe
- Watercourse
- Project Area
- Existing Westside infrastructure

Australian Painted Snipe Habitat

- Seasonal breeding, foraging and dispersal





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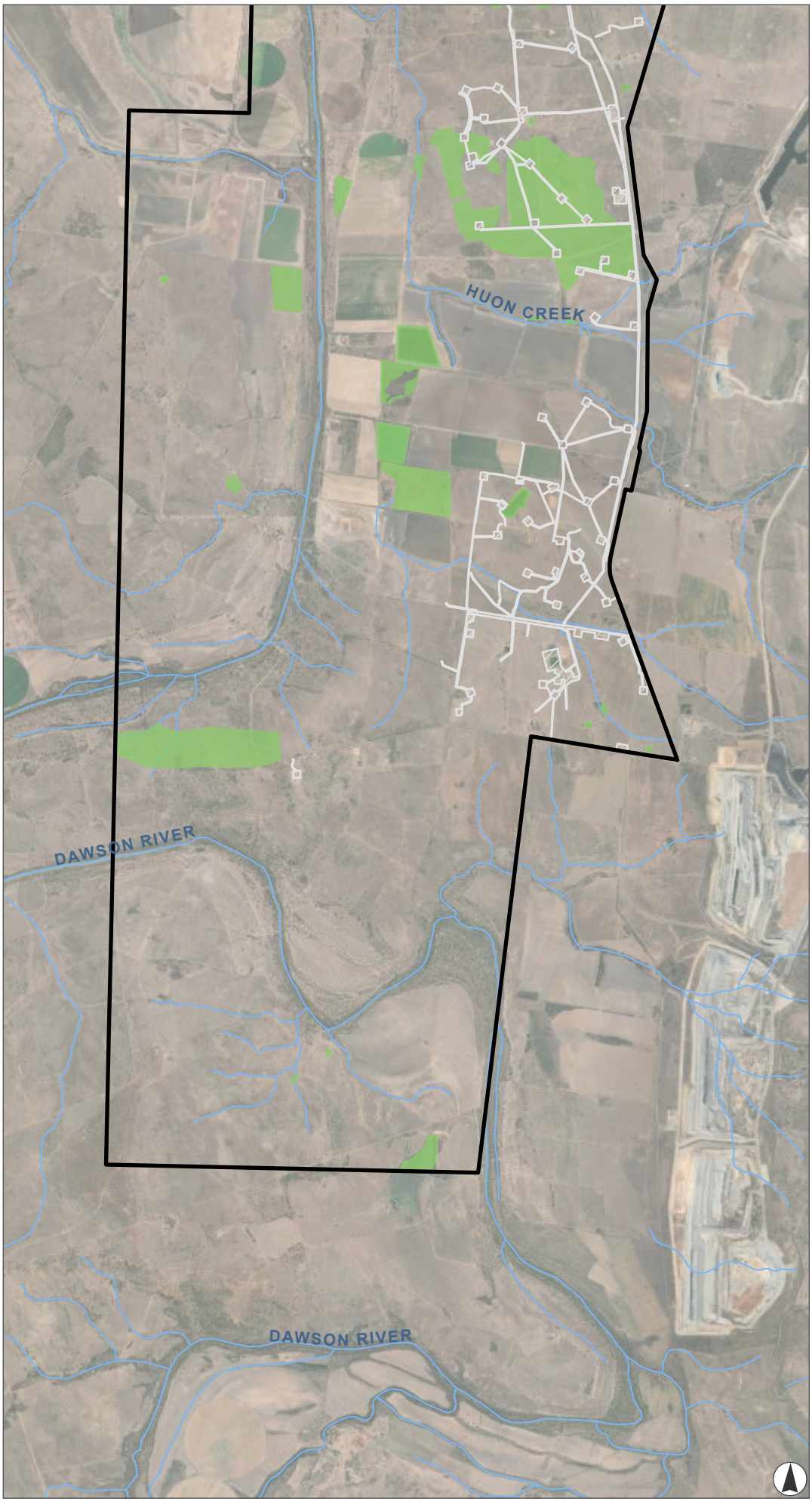


FIGURE 9.8C

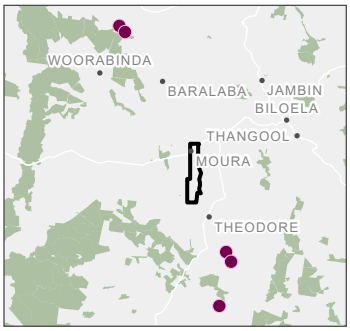
Australian painted snipe *(Rostratula australis)* Habitat and Records

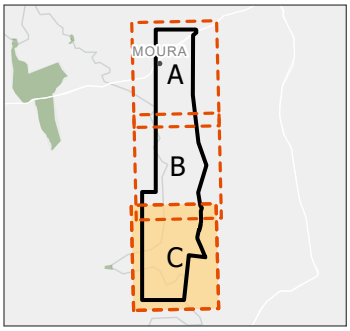
Legend

- ALA Records of Australian Painted Snipe
- Watercourse
- Project Area
- Existing Westside infrastructure

Australian Painted Snipe Habitat

- Seasonal breeding, foraging and dispersal





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9.9 Painted honeyeater (*Grantiella picta*)

9.9.1 Status under the EPBC Act

The painted honeyeater is listed as Vulnerable under the EPBC Act.

9.9.2 Distribution and Habitat Requirements

This species is highly nomadic, sparsely and widely distributed from south-eastern Australia to north-western QLD and eastern Northern Territory. The greatest concentrations and almost all records of breeding come from south of 26ºS, on inland slopes of the Great Dividing Range between the Grampians, Victoria and Roma, QLD (Threatened Species Scientific Committee, 2015b). Many birds move after breeding to semi-arid regions such as north-eastern South Australia, central and western QLD, and central Northern Territory.

As outlined in *The National Recovery Plan for the Painted Honeyeater* (Department of Agriculture, Water and the Environment, 2021), seven Key Biodiversity Areas (KBAs) are currently recognised as important for Painted Honeyeater conservation and to support the long-term persistence of the species. Of the seven KBAs, only one occurs within QLD: Boodjamulla – Boodjamulla National Park, formally known as Lawn Hill National Park, which is a national park in the Shire of Burke, located near the Northern Territory border.

The painted honeyeater occurs in dry forests and woodlands, where its primary food is mistletoes in the genus *Amyema*, though it will also take some nectar and insects. Invertebrates are of particular importance as a dietary item provided to nestlings and are also used by adults in the breeding season. The species is also known to occur in riparian woodland communities dominated by species such as *Eucalyptus camaldulensis*, *Casuarina sp., Callitris sp.,* and in *Acacia* dominated woodlands, paperbarks, and trees on farmland and in gardens. The species demonstrates preference for wider patches of remnant woodland and areas with higher numbers of older trees as mistletoes are largely restricted to these trees. However, it is known to also utilise narrow roadside strips of vegetation provided that ample mistletoe is available (Threatened Species Scientific Committee, 2015).

The species exhibits seasonal north-south movements governed principally by the fruiting of mistletoe, with which its breeding season is closely aligned (Barea and Watson 2007). Breeding occurs in October to March. Many birds move after breeding to semi-arid regions such as north-eastern South Australia, central and western Queensland, and central Northern Territory. Considering its dispersive, nomadic habits, the species is considered to comprise a single population (Garnett et al. 2011).

At least five species of *Amyema* mistletoe have been documented as being a food source for the painted honeyeater, which in turn assists in dispersal of the mistletoe by excreting the seed (Reid 1987). Fruit of the Grey Mistletoe (*Amyema quandang*) is a source of carbohydrates, protein and water, and accounts for a significant amount of their diet (Barea and Watson 2013).

9.9.3 Threats

The primary identified threat to this species is habitat loss. Both breeding and non-breeding habitat has been subject to extensive clearing in the past, or degraded to the point where they no longer provide suitable habitat. Regrowth woodland, which contains similar or higher densities of mistletoe than remnant woodland, is viewed as having little conservation value and is also being cleared at an unsustainable rate.

Other identified threats include:

- Habitat degradation by grazing livestock, native macropods and rabbits leading to a collapse in mistletoe resources.
- Deliberate destruction of mistletoe by landholders and in production forests.
- Competition with the native noisy miner (*Manorina melanocephala*).
- Predation by invasive species such as the black rat (*Rattus rattus**).
- Collision with road vehicles.
- Nest predation by over-abundant native birds including currawongs, butcherbirds, crows and ravens.

9.9.4 Occurrence and Potential Habitat

The painted honeyeater was not recorded during the field survey program. It is conservatively considered to have a moderate likelihood of occurrence within the Project Area primarily due to the presence of suitable habitat, indicated by both State mapping and the findings of the field survey program. The Project Area is located in the north-eastern extent of the species mapped distribution (within the 'may occur' category), between 24º 30' and 24º 42'.

Records of the species in the region are rare and none occur within the desktop search extent. The closest ALA record (dated 2017) is located approximately 28 km south of the Project Area along the Leichardt Highway. This record sourced from BirdLife Australia was supported with a 'unusual record report form' given the species' previous absence from the wider area. The species was not detected during surveys for any of the other identified projects in the region that have been referred in the last decade, including the Banana Range Wind Farm, which occurs closer to areas of with public records (see **Section 6.2.2**). A review of eBird and the species' 'range map' confirms the species rarity in the region, with presence exclusively limited to the Biloela area north east of the Project Area (eBird, 2025). This suggests the species' occurrence within the Project Area is likely to be sporadic and opportunistic in nature, with periods of absence potentially common. Nonetheless, for the purposes of this assessment the species is conservatively presumed present.

As described in **Section 9.9.2**, the painted honeyeater relies heavily on mistletoe for life-cycle requirements and prefers those from the genus *Amyema*. Mistletoe presence is highly variable across the Project Area, with the findings of the field survey program determining it was absent in many of the patches assessed but occasional to common in others. At least two species of mistletoe are present and occasionally occurred together in the same patch, including *Amyema quandang* and *Lysiana subfalcata* (**Photo 9.1**). Only one of these is a preferred species for the painted honeyeater. A range of REs were found confirmed to support mistletoe in at least one location including RE 11.3.1, 11.3.4, 11.3.25, 11.4.3, 11.4.8 and 11.9.2.
Grey mistletoe was primarily recorded within areas of RE 11.4.8.

A total of 2,555.4 ha of potential painted honeyeater habitat is mapped within the Project Area. Based on the geographical location of the Project Area (substantially north of known breeding locations), potential habitat is suitable for foraging and dispersal purposes only. Potential habitat includes woodland ecosystems, as well as riparian woodlands and *Acacia* scrubs in regrowth and remnant condition, analogous to REs 11.3.1, 11.3.2,11.3.3, 11.3.4, 11.3.6, 11.3.17, 11.3.25, 11.3.27f, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.9a, 11.4.12, 11.5.2, 11.9.1, 11.9.2, 11.9.5, 11.9.7, 11.9.10. Although mistletoe was generally rare across the Project Area, all areas of suitable vegetation have been conservatively considered suitable.

The extent of mapped painted honeyeater habitat within the Project Area is provided below in **Table 9.18**, and the mapped habitat is shown on **Figure 9.9**.

Table 9.18 Habitat Extent for Painted Honeyeater

Habitat Utilisation	Habitat Definition	Extent within the Project Area (ha)
Foraging and dispersal	Woodlands, forests and riparian woodlands dominated by species from the genera *Eucalyptus*, *Acacia*, *Melaleuca*, *Casuarina* and/or *Callitris*, that support mistletoe.	2,555.4
	Total	**2,555.4**

Potential habitat within the Project Area is relatively extensive although highly fragmented. Given this species is known to be highly nomadic, fragmentation is considered unlikely to impede the species' utilisation of potential habitat across the landscape. However, this species is reported to prefer large and wide habitat patches which are very limited within the Project Area. Furthermore, as mistletoe to date has been recorded infrequently, and not all areas of potential habitat have been ground-truthed, it is possible that the extent of potential habitat is currently overstated and not all areas contain the important habitat features (i.e. mistletoe) to support the species.



Photo 9.1 Flowering *Lysiana subfalcata*, within a patch of RE 11.4.8 in the northern Project Area

9.9.5 Important Populations

The SPRAT does not identify 'important populations' of painted honeyeater. Therefore, any population potentially occurring within the Project Area has been assessed against the generic definition in the *EPBC Act Significant Impact Guidelines 1.1.*

The species comprises a single, connected population (Garnett et al. 2011), suggesting that genetic exchange is occurring across its range. The species is also highly mobile and nomadic, potentially moving seasonally in response to resource availability. There is no evidence to suggest that any population potentially present within the Project Area would be a key source population for breeding or dispersal or necessary for maintaining genetic diversity and the Project Area is not near the limit of the species range. As such, the Project Area is unlikely to support an important population of painted honeyeater.

9.9.6 Habitat Critical to the Survival of the Species

The National Recovery Plan for the Painted Honeyeater (Department of Agriculture, Water and the Environment, 2021) identifies habitat critical to the survival of the painted honeyeater as areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal;
- For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species, such as pollinators);

- To maintain genetic diversity and long-term evolutionary development; or
- For the reintroduction of populations or recovery of the species.

Habitat critical to the survival of the Painted Honeyeater includes:

- Breeding habitat: known or likely breeding habitat in Boree/Weeping Myall (*Acacia pendula*), Brigalow (*Acacia harpophylla*) woodlands, box-gum woodlands and box-ironbark forests on the inland slopes of the Great Dividing Range in NSW, Victoria and southern QLD.
- Foraging habitat: all preferred foraging species within known and likely foraging habitat particularly mistletoes of the genus *Amyema* growing on forest and woodland eucalypts and acacias.
- Habitat for the long-term maintenance of the species: all Key Biodiversity Areas with painted honeyeater as a Trigger species, and suitable habitat in future climate niches as information becomes available.

Although no potential breeding habitat occurs, suitable foraging and dispersal habitat has been identified within the Project Area. On this basis, the habitat within the Project Area is potentially necessary for activities such as foraging and dispersal and hence meets the definition of habitat critical to the survival of the species.

The National Recovery Plan for the Painted Honeyeater (Department of Agriculture, Water and the Environment, 2021) also specifies key considerations for impact assessments that relate to habitat critical to the survival of the species. It states,

> *"[w]hen considering habitat loss, alteration or degradation to habitat in any part of the painted honeyeater's range, including in areas where the species 'may occur', surveys for occupancy at the appropriate times of the year and identifying preferred foraging species are an important tool in refining understanding of the area's relative importance for painted honeyeaters. In addition, it is also important to note that painted honeyeaters opportunistically use areas depending on the occurrence of eucalypt flowering and mistletoe flowering/fruiting. This means that areas that constitute habitat critical to the survival might not have birds in any one given year. This pattern of habitat use means that both recent survey data and historical records need to be considered when assessing the relative importance of a local area or region for painted honeyeaters".*

The Project Area occurs wholly within the 'may occur' extent of the species distribution and is not located near a KBA or any location the species is known to frequently or consistently occur. As described above in **Section 9.9.4**, painted honeyeater presence within the Project Area and wider region is rare and indicates visitation is sporadic and opportunistic. The broadscale historical modification within the region for agriculture is likely to have significantly reduced the availability of habitat and the integrity of habitat patches that have persisted (predominantly small, fragmented patches). This suggests that although habitat within the Project Area may meet the definition of habitat critical, its relative importance to the species is likely very low as its use is rare.

9.9.7 Potential Project Impacts and Key Mitigation Measures

Over the life of the Project, Westside have committed to a cumulative maximum disturbance of 6.9 ha of foraging and dispersal habitat. Direct impacts on painted honeyeater habitat will be preferably avoided and minimised, as per the constraints hierarchy (**Section 8.1**).

To ensure patch viability and functionality is maintained at current levels, the siting of Project infrastructure (including wells, gathering infrastructure, tracks and other ancillary infrastructure) within or adjacent to moderate constraint areas (including painted honeyeater foraging and dispersal habitat) will adhere to the following rules:

- Patches that are 0.5 ha or less must be completely avoided by the Project (no direct impacts permitted).
- Patches that are 1.0 ha or less must not be dissected in a way that creates two new patches.
- Direct impacts must not reduce the patch size to less than 0.5 ha OR isolate the patch by more than 50 m to the nearest patch (unless already isolated by more than 50 m).
- Patches >1.0 ha must not be dissected in a way that creates one patch <0.5 ha.

Potential indirect impacts of the Project on the painted honeyeater includes:

- Increased competition with other species, particularly the noisy miner (*Manorina melanocephala*), and/or nest predation by other species, such as pied and grey butcherbirds (*Cracticus nigrogularis* and *C. torquatus*), that become displaced by clearing.
- Injuries or death from vehicle strikes.

General mitigation measures are outlined in **Section 8.2.1**. Mitigation measures specific to painted honeyeater are outlined in **Section 8.2.2** and below:

- Painted honeyeater individuals and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of painted honeyeater habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped).
- During the field scouts, the diversity and abundance of mistletoe within areas of suitable habitat must be assessed and mapped. This data will inform the assessment by field scouts, regarding the impacts to foraging and dispersal habitat, and specifically any potential changes in habitat functionality. No loss of habitat functionality per patch will be permitted, as determined by a suitably qualified ecologist. This can be measured by:
    - Reduction in relative abundance: A loss of habitat functionality may occur in areas assessed using relative abundance, where there is a change in mistletoe abundance from rare to absent. Depending on the context, a reduction from abundant mistletoe to occasional mistletoe may not impact functionality.

- Reduction in individual plants with mistletoe: In areas assessed where individual plants have been mapped, any reduction >10% may impact functionality.

- Direct impacts to painted honeyeater habitat are permitted only to a cumulative maximum disturbance limit of 6.9 ha. Direct impacts to potential painted honeyeater habitat will be avoided to the maximum extent possible.

- When clearing potential painted honeyeater habitat, micro-siting will aim to maximise the avoidance of trees containing the species preferred mistletoe, which are from the genus *Amyema*.

- Where clearing is proposed for areas of painted honeyeater habitat, a fauna spotter-catcher must be present. Immediately prior to clearing any painted honeyeater habitat, the fauna spotter-catcher will complete canopy searches to identify any foraging individuals. The movements of any identified individuals should be monitored during the completion of clearing works to ensure they relocate of their own volition.

- In the unlikely event that a painted honeyeater is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days.

- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.

9.9.8 Significant Impact Assessment

The significant impact assessment for this species is presented in **Table 9.19** below. In summary, the assessment found that the Project is **unlikely to result in a significant impact on the painted honeyeater**.

Table 9.19 Significant Impact Assessment – Painted honeyeater

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant impact?
Lead to a long-term decrease in the size of an important population of a species	The painted honeyeater was not recorded during the field survey program and has been rarely recorded in the wider region. It has been conservatively assessed as having a moderate likelihood of occurrence within the Project Area, primarily due to the presence of potential habitat suitable for foraging and dispersal. The species is nomadic. In the non-breeding season, birds show up in random areas outside their core habitat (usually in association with fruiting mistletoes) either singly or in small groups. Since this species typically breeds south of Roma in QLD, breeding habitat is not considered supported by the Project Area. The Project may result in direct impacts via vegetation clearing to a cumulative maximum of 6.9 ha of foraging and dispersal habitat. Project development will occur in phases and as such only a portion of the Project Area may be disturbed at one time. Several mitigation measures are in place to ensure habitat to be retained within the Project Area remains viable for the species, with functionality to remain consistent with baseline levels.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant impact?
	Visitation by the species to the Project Area is likely to occur sporadically, during winter when the painted honeyeater is more likely to be found in the north of its distribution. Any population utilising the Project Area is not considered an important population, as described above in **Section 9.9.5**, as the species comprises one population across its range. The risk of mortality during construction or operation and the Project (largely comprising underground infrastructure) is considered very low given the species likely rare presence and high mobility. Further, the Project will not result in a barrier to movement for the species. Indirect impacts on the species as a result of the Project are expected to be limited. The Project is highly unlikely to increase or introduce pests as many are known to occur already and existing conduits for movement are present. Given the potential absence or infrequent use of the Project Area by this species as well as the implementation of Project management plans including the EMP and SSMP, a long-term decrease in the size of a population is unlikely to result from the Project.	
Reduce the area of occupancy of an important population	The area of occupancy for the species is estimated to be 1,000 km^2 (Garnett, Szabo and Dutson, 2011). Habitat mapping within the Project Area has identified a total of 2,829.25 ha of potential foraging and dispersal habitat, of which only 6.9 ha will be directly impacted via vegetation clearing. This species is highly nomadic and the landscape in which the Project Area occurs is already highly disturbed and fragmented, and direct impacts are likely to be focused to the edges of habitat patches where disturbance is already likely to be high. No significant changes to the relative abundance of mistletoe per habitat patch or corridor, as determined by the suitably qualified ecologist, will be permissible. Given the extent of habitat in the region and the relatively small amount of habitat being impacted within the Project Area, it is considered unlikely the Project will reduce the area of occupancy of any local or important population. Based on this, Project works are considered unlikely to materially reduce the availability or quality of habitat for the species to the point where the species' extent of occupancy would be reduced.	Unlikely
Fragment an existing important population into two or more populations	The painted honeyeater is a highly mobile species which undergoes large movements that are likely seasonal. Potential habitat within the Project Area is highly fragmented as a result of historical clearing and agricultural practices, and connectivity is limited to riparian corridors and areas of roadside vegetation. The Project will maximise the use of existing cleared areas to minimise further habitat fragmentation. No significant patch isolation will occur indicating that landscape connectivity overall will be maintained, and no barriers to movement for the species will occur. Given the ability for this species to readily disperse across the landscape, vegetation clearance associated with the Project is unlikely to present barriers to this species local movement, to the extent that it fragments any population of this species within the Project Area.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant impact?
Adversely affect habitat critical to the survival of a species	Potential habitat supported by the Project Area meets the definition of habitat critical to the survival of the species, as described in **Section 9.9.4** above. However, habitat is highly fragmented and often comprises small and narrow patches or corridors. It is likely that not all mapped areas of habitat contain the important mistletoe required to support the species. The Project Area occurs wholly within the 'may occur' extent of the species distribution and is not located near a KBA or any location the species is known to frequently or consistently occur. Painted honeyeater presence within the Project Area and wider region is rare and indicates visitation is sporadic and opportunistic. The significant nature and extent of historical modification within the region for agriculture is likely to have significantly reduced the availability of habitat and the value of habitat patches that have persisted (predominantly small, fragmented patches). This suggests that although habitat within the Project Area may meet the definition of habitat critical, its relative importance to the species is likely very low as its use is rare. Direct impacts will be permissible to a cumulative maximum area of 6.9 ha of foraging and dispersal habitat. During the field scouts, the diversity and abundance of mistletoe within areas of suitable habitat must be assessed and mapped. This data will inform the assessment by field scouts, regarding the impacts to foraging and dispersal habitat, and specifically any potential changes in habitat functionality. To ensure habitat functionality is maintained in retained habitat, no significant changes to the relative abundance of mistletoe per habitat patch or corridor, as determined by the suitably qualified ecologist, will be permissible. Wherever possible, clearing will be avoided and trees containing mistletoe will be retained. The direct impact to potential habitat will occur over the life of the Project, and likely in small, isolated areas, i.e. patch edges rather than removing or dissecting patches. This small magnitude of habitat loss is unlikely to be considered an 'adverse effect' on habitat critical as per the Conservation Advice, particularly when considering the measures in place to maintain habitat function for the species.	Unlikely
Disrupt the breeding cycle of an important population	The Project Area is not situated within the primary known breeding area of the species which is on the inland slopes of the Great Dividing Range, south of Roma. Potential habitat supported by the Project Area is therefore not suitable for breeding and no impacts on breeding individuals will occur. The species is highly mobile and nomadic; foraging and dispersal activities completed within the non-breeding season are not known to be a limiting factor to breeding timing or success. Given the potential absence or infrequent use of the Project Area by this species, the Project is unlikely to disrupt the breeding cycle of a population.	Unlikely
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Although potential habitat within the Project Area is critical to the survival of the species, habitat is already fragmented and likely to be highly disturbed by exotic grass and cattle grazing. Wherever possible, clearing will be avoided and trees containing mistletoe will be retained. Clearing will only be conducted as strictly necessary. A maximum of 6.9 ha of foraging and dispersal habitat will be directly impacted as a result of the Project. The breeding, foraging and dispersal habitat is not considered highly unique or important for refuge and habitat with similar characteristics, quality and condition occurs widely within the region.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant impact?
	It is recognised that potential indirect impacts on habitat that will be retained may occur as a result of the Project including habitat degradation from increased dust, edge effects, weeds and temporary altered hydrology. Indirect impacts will be actively managed via Project management plans and include measures such as erosion and sediment control, dust suppression and weed and pest management. Given potential absence or infrequent use of the Project Area by this species as well as the high mobility of the species, it is unlikely that the Project will alter habitat to the extent where the species is likely to decline.	
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Predation by black rat is considered to be a threat to the species (Threatened Species Scientific Committee, 2015b). Although not observed during field surveys, black rat may occur in the area with numbers fluctuating according to seasonal conditions. Rats may pose a threat to the species during plague periods. The Project will employ best practice control methods for invasive pests including responsible waste management to minimise the attraction of predatory fauna/pest species and the implementation of a weed, pest and biosecurity management plan. Based on this, it is unlikely the Project will result in invasive species that are harmful to the painted honeyeater becoming established or exacerbated.	Unlikely
Introduce disease that may cause the species to decline	Disease has not been identified as a threat to the species. The Project will follow best practice construction and operational methods; therefore, introduction of a disease is unlikely.	Unlikely
Interfere substantially with the recovery of the species	A National Recovery Plan for the Painted Honeyeater was published in 2021. Six main strategies are detailed: 1. Protect, manage and restore painted honeyeater breeding and foraging habitats at the local, regional and landscape scales. 2. Monitor, reduce and manage threats and sources of mortality. 3. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions. 4. Improve understanding of habitat use at a landscape scale in order to better target protection and restoration measures. 5. Engage local communities and stakeholders in painted honeyeater conservation. 6. Coordinate, review and report on recovery progress. Given the overall retention of the majority of potential habitat within the Project Area, the 6.9 ha reduction in habitat is considered to have negligible impacts on the species in the long-term or on a population scale. This is due to the low relative value of the habitat present within the Project Area. The Project will not result in disruptions to breeding cycles and existing threats to the species are unlikely to be increased. As such, the Project is considered unlikely to interfere substantially with the recovery of the species.	Unlikely

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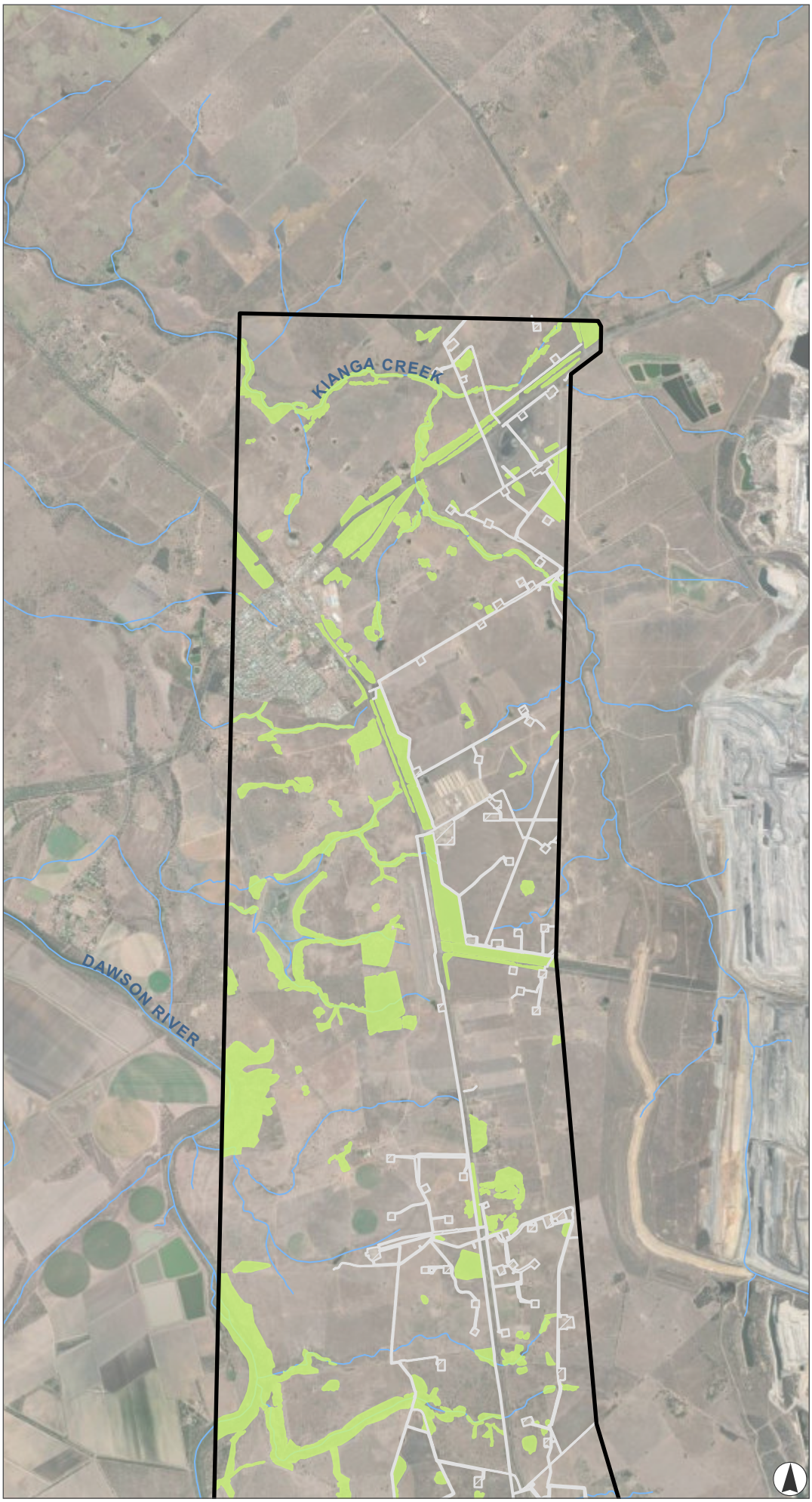


FIGURE 9.9A

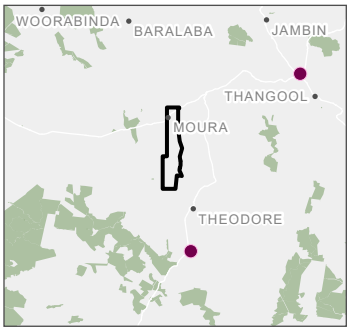
Painted honeyeater *(Grantiella picta)* Habitat and Records

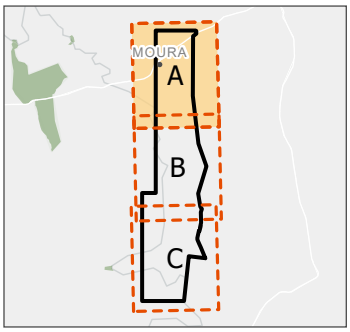
Legend

- ALA Records of Painted Honeyeater
- Watercourse
- Project Area
- Existing Westside infrastructure

Painted Honeyeaeter Habitat

- Foraging and dispersal





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Kilometres

Scale 1:80,000 at A4
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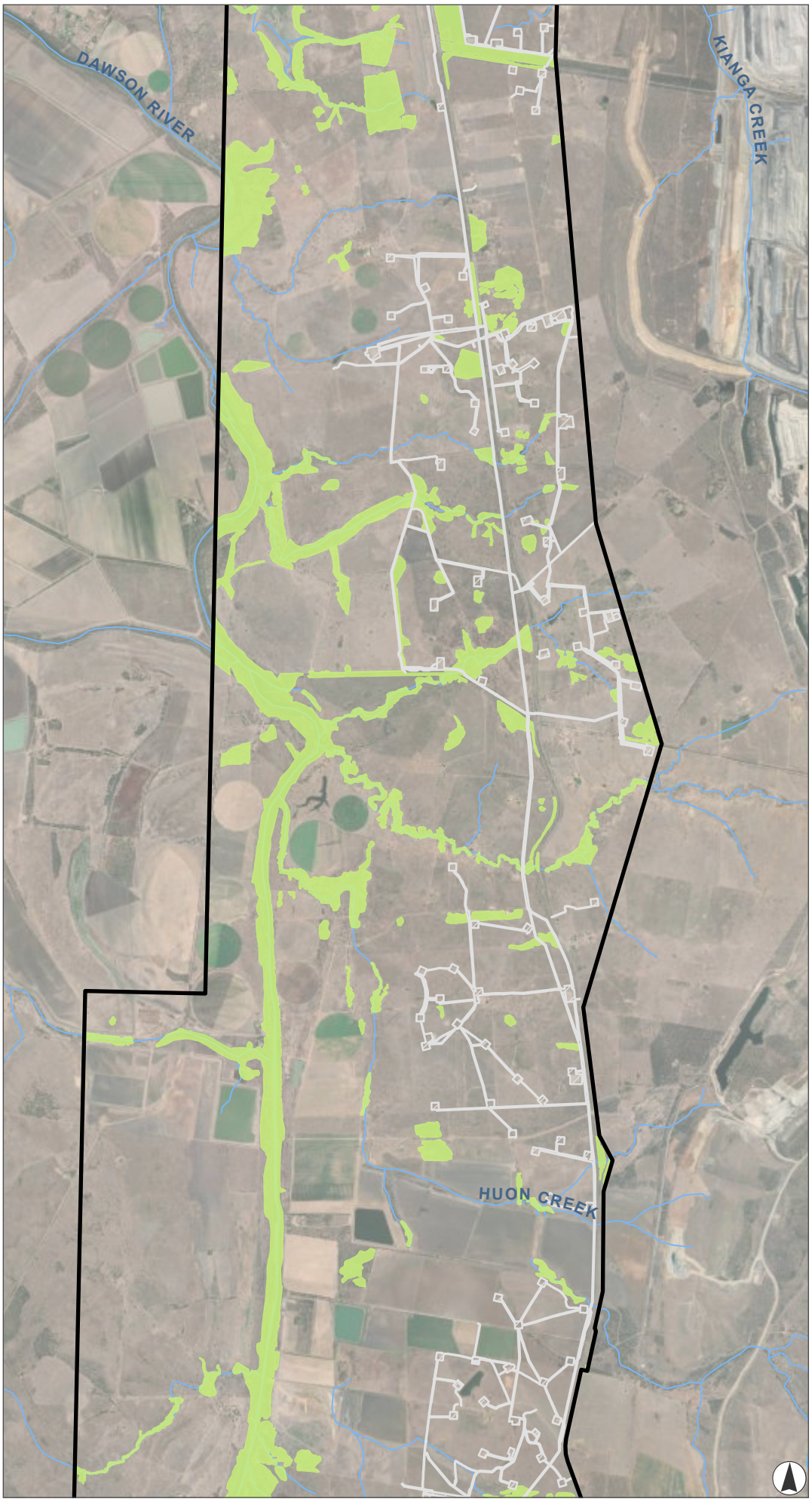


FIGURE 9.9B

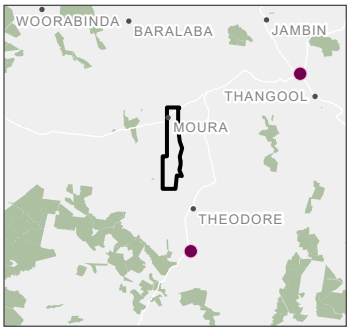
Painted honeyeater *(Grantiella picta)* Habitat and Records

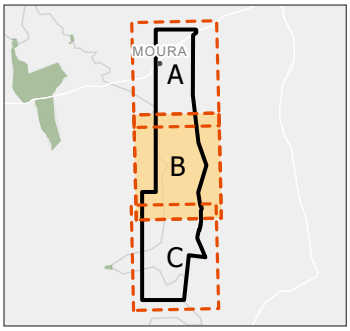
Legend

- ALA Records of Painted Honeyeater
- Watercourse
- Project Area
- Existing Westside infrastructure

Painted Honeyeaeter Habitat

- Foraging and dispersal





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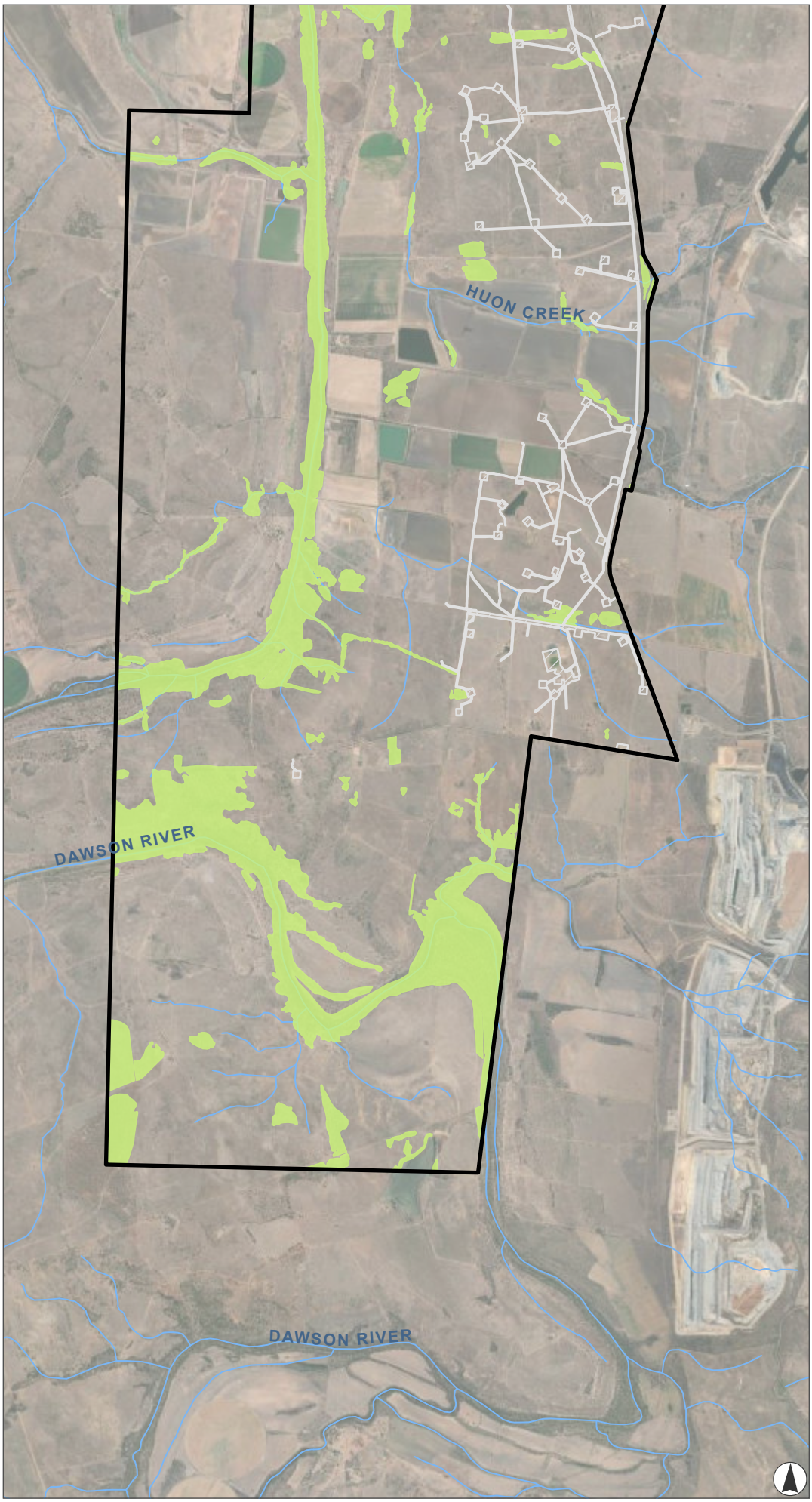


FIGURE 9.9C

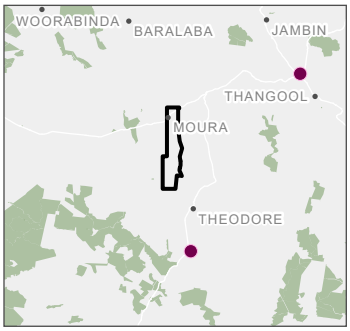
Painted honeyeater *(Grantiella picta)* Habitat and Records

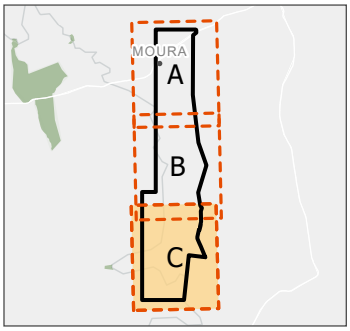
Legend

- ALA Records of Painted Honeyeater
- Watercourse
- Project Area
- Existing Westside infrastructure

Painted Honeyeaeter Habitat

- Foraging and dispersal





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9.10 Ornamental snake (*Denisonia maculata*)

9.10.1 Status under the EPBC Act

The ornamental snake is listed Vulnerable under the EPBC Act.

9.10.2 Distribution and Habitat Requirements

The ornamental snake is found in eastern QLD within the drainage system of the Fitzroy and Dawson Rivers, from south-west Townsville in the north to south of Theodore. It is primarily confined to the Brigalow Belt North but also occurs in parts of the Brigalow Belt south. Several known localities of the species are identified on SPRAT and include 'near Moura', where the Project Area occurs.

Suitable habitat may include floodplains, undulating clay pans and along the margins of swamps, lakes and watercourses. It also occurs on adjoining areas of elevated ground and has been recorded in woodlands and open woodlands of coolabah, poplar box, and brigalow, and in fringing vegetation along watercourses. Is known to prefer woodlands and open forests associated with moist areas, particularly gilgais and depressions, but also lake margins and wetlands (Department of Climate Change Energy the Environment and Water, 2022).

The species is nocturnally active, sheltering during the day under fallen timber, rocks, bark and in deep soil cracks. The species is probably active year-round with the exception of the cooler months, with peak activity likely to be early summer through to the wet season. During dry times the snake can remain inactive in suitable shelter sites for months (Department of Climate Change Energy the Environment and Water, 2022). Tracking completed as part of Veary 2011 found an individual moved a total of 54 m from the point of release over 5 tracking events during a 5 month period.

Frogs from four genera comprise 95% of the ornamental snake's diet with 10 species most commonly recorded within suitable habitat for this species (Shine, 1983). These genera include *Cyclorana, Limnodynastes, Litoria* and *Platyplectrum*, all of which are found within the Project region. Ornamental snakes require specialised habitat features such as surface water and aquatic vegetation to hunt frogs within suitable gilgai habitat. These snakes are heavily reliant on the presence of habitat features which support prey abundance.

9.10.3 Threats

The primary threat to the species is continued modification of potential habitat through broadscale clearing and habitat degradation (Department of Agriculture Water and the Environment, 2014). The core range of the species is within an area of high human impact through extractive industries (i.e. coal mining; coal seam gas), agriculture and urban development. Habitat degradation is often caused by overgrazing by stock, especially cattle, or grazing of gilgais during the wet season which leads to soil compaction and compromising of soil structure.

Other threats include destruction of wetland habitat by feral pigs which also contributes to degradation of frog habitat and direct competition for their food source, frogs. As the species primary food source is frogs, lethal toxic ingestion of cane toads which are abundant within its range, is also a threat to the species (Department of Agriculture Water and the Environment, 2014). As described on SPRAT, the two species have often been recorded in the same areas, though the cane toad is never found where the Ornamental Snake is in high numbers (Agnew 2010 pers. comm.). In addition, numerous intensive studies, in seemingly optimal ornamental snake habitats, have resulted in no snakes being found where cane toads were in abundance (Agnew 2010 pers. comm.).

All of the above threatening processes are considered to be impacting the Project Area and surrounds.

The Action Plan for Australian Reptiles states that knowledge of the ornamental snake is inadequate. More research into the species is needed, in order to define objectives and actions to assist in recovery (Cogger et al. 1993). The report identifies three crucial research areas:

- Ground surveys to determine the full geographic range and habitat requirements of the species.
- Research into basic biology and ecology of the species.
- Research into the species decline and major factors behind the decline.

9.10.4 Occurrence and Potential Habitat

The ornamental snake is known to the Project Area, with both desktop and field records of the species available. The assessment of ALA records during the desktop assessment phase of the ecological assessment identified several records from the Project region of ornamental snakes. One record (date of 1983) was found approximately 115 m from the eastern edge of the Project Area, 200 m south of Gibihi Road (10 km spatial uncertainty). The location of this historic record features gilgai formation as well as proximity to a continuous stand of brigalow (*Acacia harpophylla*), which extends into the Project Area.

Six records of the species contained in the WildNet (2024) database are also present within 20 km of the Project Area, all of which are included in ALA. Four of the six records are located north of the Project Area west of the Dawson North mine. Habitat at this location comprises gilgai in non-remnant vegetation as indicated by the aerial imagery and State RE mapping.

Targeted surveys for the species have been conducted twice across the Project Area by Umwelt: March 2020 and June 2023. The March 2020 survey was undertaken in accordance with the *Draft Referral guidelines for the Brigalow belt reptiles*. During this survey, four individuals were confirmed during a spotlight search on 24 March 2020, all recorded in the same area of regrowth brigalow woodland habitat supporting gilgai, located in the northeast corner of the Project Area (**Section 6.5.2.1**). Three of the four individuals were found on bare ground with minimal ground coverage between gilgai water bodies. The fourth individual was found semi-submerged and preying on a green-striped burrowing frog (*Cyclorana alboguttata*). The habitat in this particular location comprised cleared pasture with abundant gilgai and sparse brigalow and sandalwood (*Santalum lanceolatum*) regrowth and is considered suitable for breeding and foraging. Disturbance within the area included presence of weeds and evidence of low intensity cattle grazing.

Throughout the March 2020 field survey, nine frog species were identified including the green tree frog (*Litoria caerulea*), green-striped burrowing frog broad-palmed rocket-frog (*Litoria latopalmata*), ornate burrowing frog (*Platyplectrum ornatum*), scarlet-sided pobblebonk (*Limnodynastes terraereginae),* salmon-striped frog (*Limnodynastes salmini*), spotted marsh frog (*Limnodynastes tasmaniensis*), desert tree frog (*Litoria rubella*) and eastern snapping frog (*Cyclorana novaehollandiae*). All species are likely to comprise potential prey species of the snake. Field assessment sites with the highest diversity of prey species for the ornamental snake tended to associate with habitat which supported a mosaic of suitable microhabitat features such as gilgai and surface water. One introduced species, cane toad (*Rhinella marina**), was identified in abundance throughout all habitat types within the Project Area, including in the gilgai formations. Potential frog habitat and ALA records are illustrated on **Figure 9.11**.

The June 2023 survey did not record any ornamental snakes or native frogs; however, this was expected given the prevailing season (winter), lack of recent rainfall and completion of only daytime habitat assessment surveys. The purpose of the survey was to further validate areas of mapped ornamental snake habitat. As described in **Section 4.3.5**, properties surveyed were those considered preferred for the Project. To guide and inform the survey, as well as understand potential changes in observable habitat quality during winter (when future field scouts may occur), the known location of ornamental snake (as recorded in March 2020 by Umwelt) was also assessed.

Both surveys found that the Project Area generally comprises historically cleared, exotic pasture grassland with remnant and regrowth strands of vegetation persisting in fragments. Gilgai habitat occurs throughout the Project Area among cleared, remnant and regrowth communities. DoR soil mapping associated with the Dawson Valley was found to identify areas of gilgai soils to moderate levels of accuracy despite the large map scale (**Figure 6.1**). Commonly, gilgai occurred through cleared pasture grasslands forming continuous clay plains of habitat with minimal to absent tree or shrub cover. In these locations, gilgai was generally shallow and exotic grass cover was high to very high, dominated by naturalised pasture grasses such as buffel grass (*Cenchrus ciliaris**) and Rhodes grass (*Chloris gayana**). No surface water was present in any cleared pasture grassland location in June 2023 and was rare in October 2020. Soil cracks, while occasionally present, appeared to be deeply infested by exotic grass roots especially in areas where grazing had been restricted. Habitat opportunities for ornamental snake within cleared pasture grassland tended to be limited, also lacking other micro habitat features except for rare to occasional tussocks of native grasses or sedges within the gilgai. These areas have been captured as dispersal habitat as it is acknowledged that changes in grazing pressures and water availability may create dispersal opportunities for the species.

Within regrowth and remnant vegetation types, canopy cover was higher, resulting in reduced invasive grass cover (shading effect). With less exotic grass, increased opportunities are created for the ornamental snake with access between gilgai, valuable soil cracks (micro habitat connectivity) and the habitat quality for foraging resources (frogs) is anticipated to be increased. Tree species commonly encountered in these vegetation types include brigalow and coolabah (*Eucalyptus coolabah*). Tree roots were commonly exposed to some degree and provided small crevices suitable for sheltering as well as structure for the gilgai.
In areas of brigalow especially, fallen woody debris was common. The occurrence of these tree species along with the presence of gilgai and surface water were found to be key indicators of species presence throughout the Project Area. During the June 2023 survey, the only survey site identified to have high water availability was the same location the species was recorded in during March 2020. Water availability was indicated by the presence of *Typha latifolia* (an emergent aquatic perennial) in some of the gilgai / surface depressions.

Following consultation with DCCEEW and further review of the existing scientific literature, it was determined that due to the species' cryptic nature, distinct patterns of habitat utilisation for life-cycle processes are not known. Therefore, habitat has been categorised differently to the other fauna MNES, with 'suitable habitat' and 'not habitat' categories used instead.

A total of 4,849.2 ha of suitable habitat is mapped within the Project Area. Over half of the total area of predicted habitat has been subject to targeted ornamental snake field assessments and is considered field validated. The extent of mapped ornamental snake habitat within the Project Area is provided below in **Table 9.20**, and the mapped habitat is shown on **Figure 9.10**.

Table 9.20 Habitat Extent for Ornamental Snake

Habitat Utilisation	Habitat Definition	Extent within the Project Area (ha)
Suitable habitat	Vegetation, generally comprising woodlands and open forests but also non-remnant, associated with moist areas[1] (gilgai and depressions, undulating claypans, lake margins, wetlands and floodplains) that support key refuge microhabitat (i.e. network of soil cracks including deep cracks). Also includes fringing riparian vegetation along watercourses where substitute refuge microhabitat is supported (ground timber and exposed roots). Vegetation functionally connected to moist areas or watercourses that have low-levels, absent or impacted[2] refuge microhabitat may also be suitable if the areas provide temporary foraging opportunities (i.e. support frog habitat) and/or facilitate movement to other areas of suitable habitat.	4,849.2
Not habitat	Vegetation that is not associated with or connected to 'moist areas' (gilgai and depressions, undulating claypans, lake margins, wetlands and floodplains). Frog habitat is **not** supported, **and** area **does not** facilitate movement to other areas of suitable habitat.	16,152.8

[1]: Moist areas are defined as environments that generally support shallow ponds of surface water for extended periods. During the dry season, the presence of wetland indicator species may be used to make this assessment.
[2]: Impacted microhabitat includes soil cracks that are compromised by high levels of exotic vegetation incursion (i.e. high biomass grass incursion or weed species) or severe cattle grazing activities (which would compact soil cracks and breakdown timber).

The mapping of suitable habitat for the ornamental snake within the Project Area was also reviewed by comparing to the DES habitat suitability model for the species. As per the DES model results, the likelihood of areas within the Project Area that contain suitable habitat for the species ranges from <10% to 30–40%. Areas of 10–20% likelihood or <10% likelihood dominate the Project Area, particularly in the western and southern extents. The highest likelihood areas are limited to the north-eastern Project Area, while areas of 20–30% likelihood occur in the central Project Area. As described earlier, the species was recorded once within the Project Area during a spotlight search in 2020. This area of habitat confirmed to support the species aligns with an area mostly predicted to be 30–40% suitable, providing a degree of model validity.

Potential habitat mapping generally aligns with the DES identified suitable areas however also captures several additional areas considered <10% likely to be suitable. In accordance with the habitat definition, suitable habitat includes fringing riparian vegetation along watercourses. However, many of these areas as per the DES habitat suitability model are <10% likely to be suitable. Some areas that are potentially suitable as per the DES model have also been excluded from the Project's mapping. Many of these areas have been ground-truthed and are no longer suitable for ornamental snake due to significant agricultural activities (ongoing cropping, tilling or blade ploughing).

The extent of suitable habitat mapped within the Project Area is overall considered conservative, owing to the broad nature of the suitable habitat definition and the lack of knowledge on this species, as identified by the Action Plan for Australian Reptiles (Cogger et. al, 1993). This species is subject to a multitude of threatening processes, several of which are ongoing within the Project Area and are likely to have compounding deleterious effects on the population present. Historical land clearing and hydrological modification, ongoing grazing and high population levels of the cane toad, are all likely to have reduced habitat suitability.

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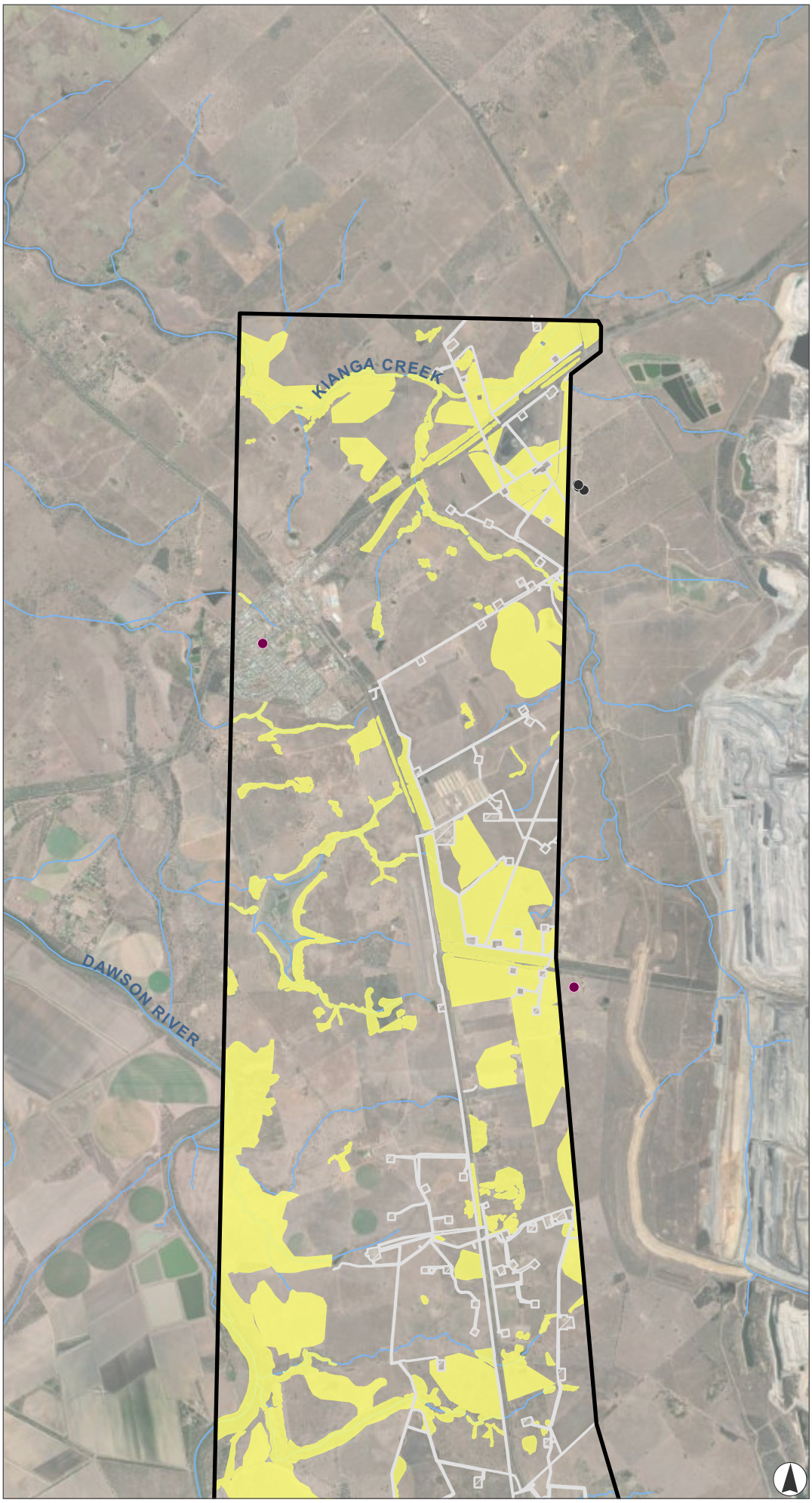


FIGURE 9.10A

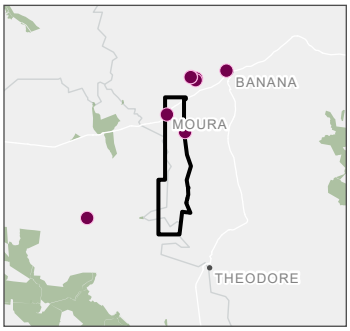
Ornamental snake *(Denisonia maculata)* Habitat and Records

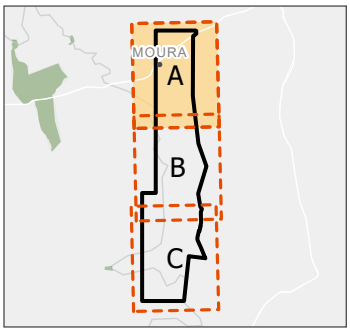
Legend

- Umwelt Records of Ornamental snake
- ALA Records of Ornamental snake
- Watercourse
- Project Area
- Existing Westside infrastructure

Ornamental snake habitat mapping

- Suitable habitat





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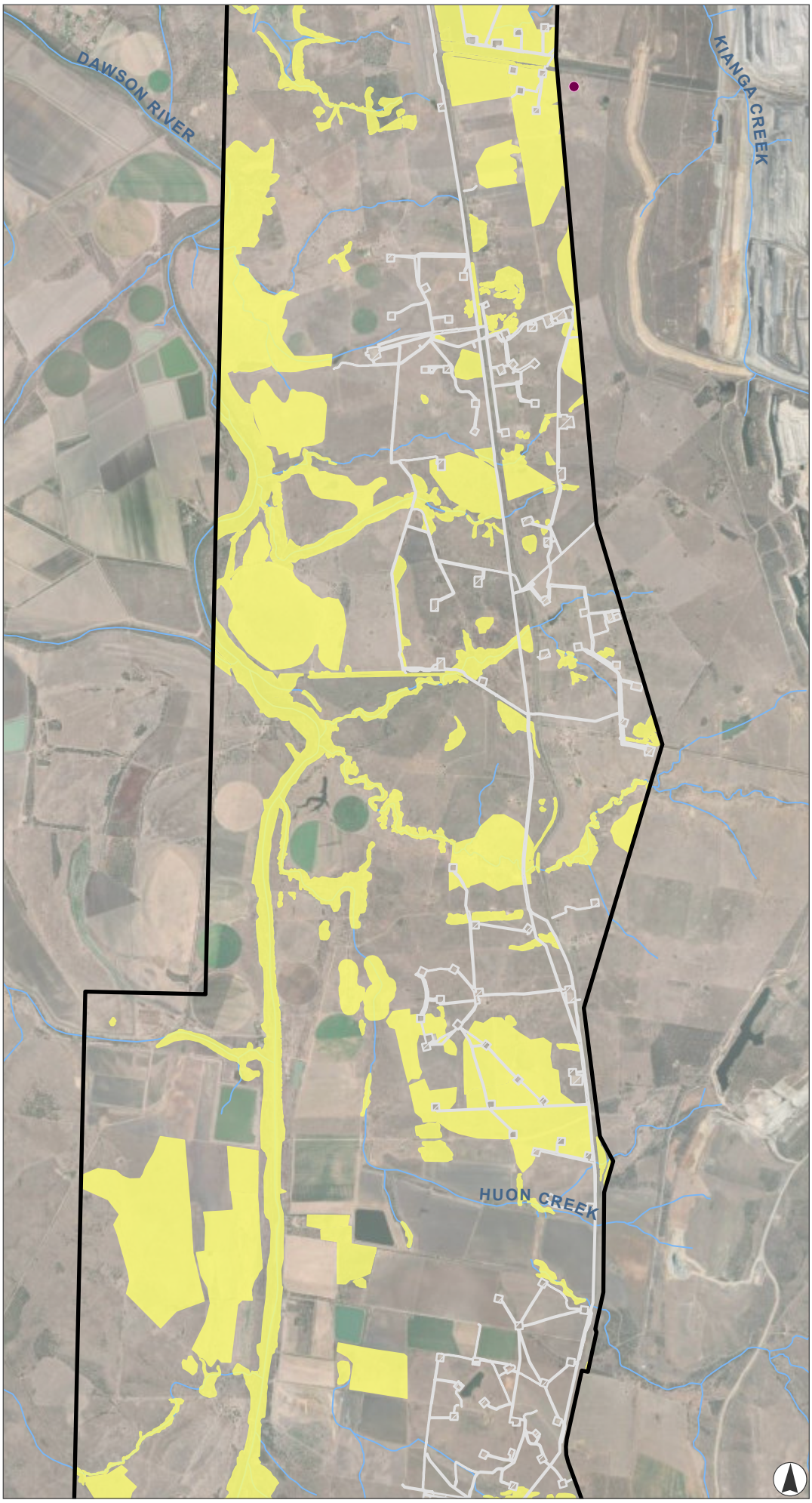


FIGURE 9.10B

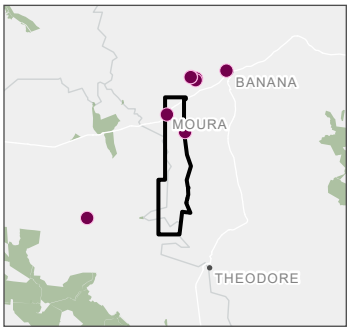
Ornamental snake *(Denisonia maculata)* Habitat and Records

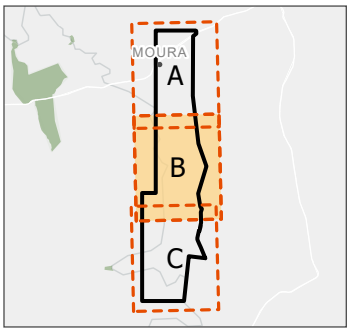
Legend

- Umwelt Records of Ornamental snake
- ALA Records of Ornamental snake
- Watercourse
- Project Area
- Existing Westside infrastructure

Ornamental snake habitat mapping

- Suitable habitat





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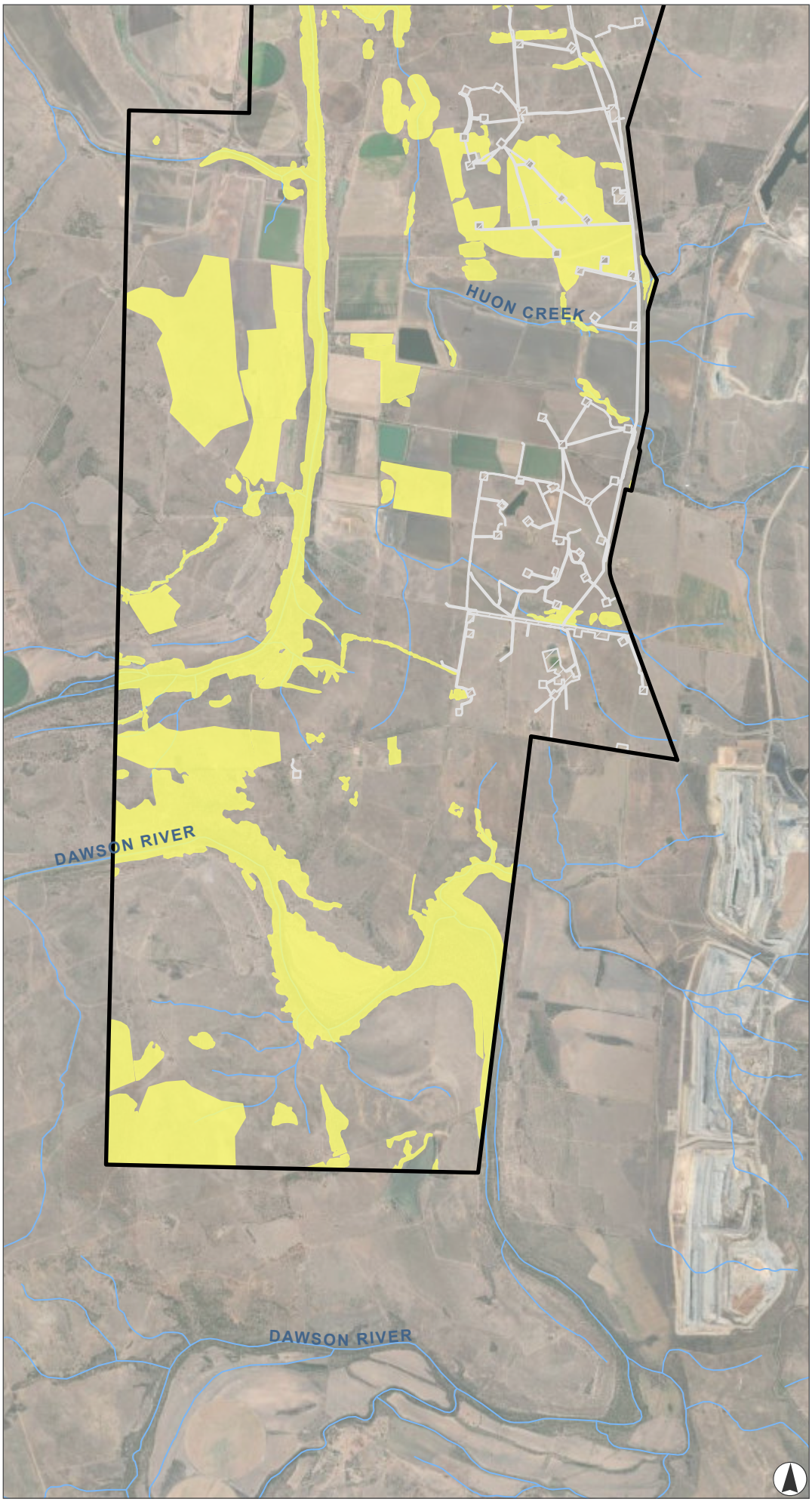


FIGURE 9.10C

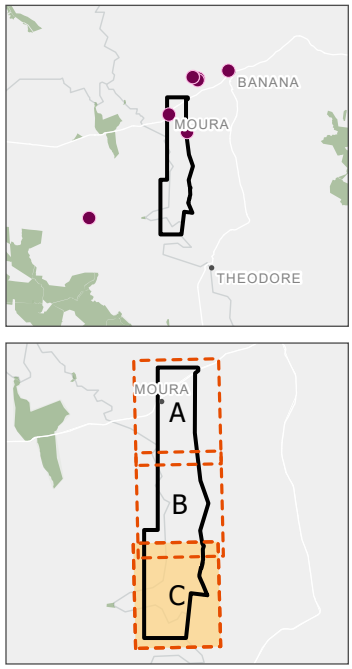
Ornamental snake *(Denisonia maculata)* Habitat and Records

Legend

- Umwelt Records of Ornamental snake
- Watercourse
- Project Area
- Existing Westside infrastructure

Ornamental snake habitat mapping

- Suitable habitat



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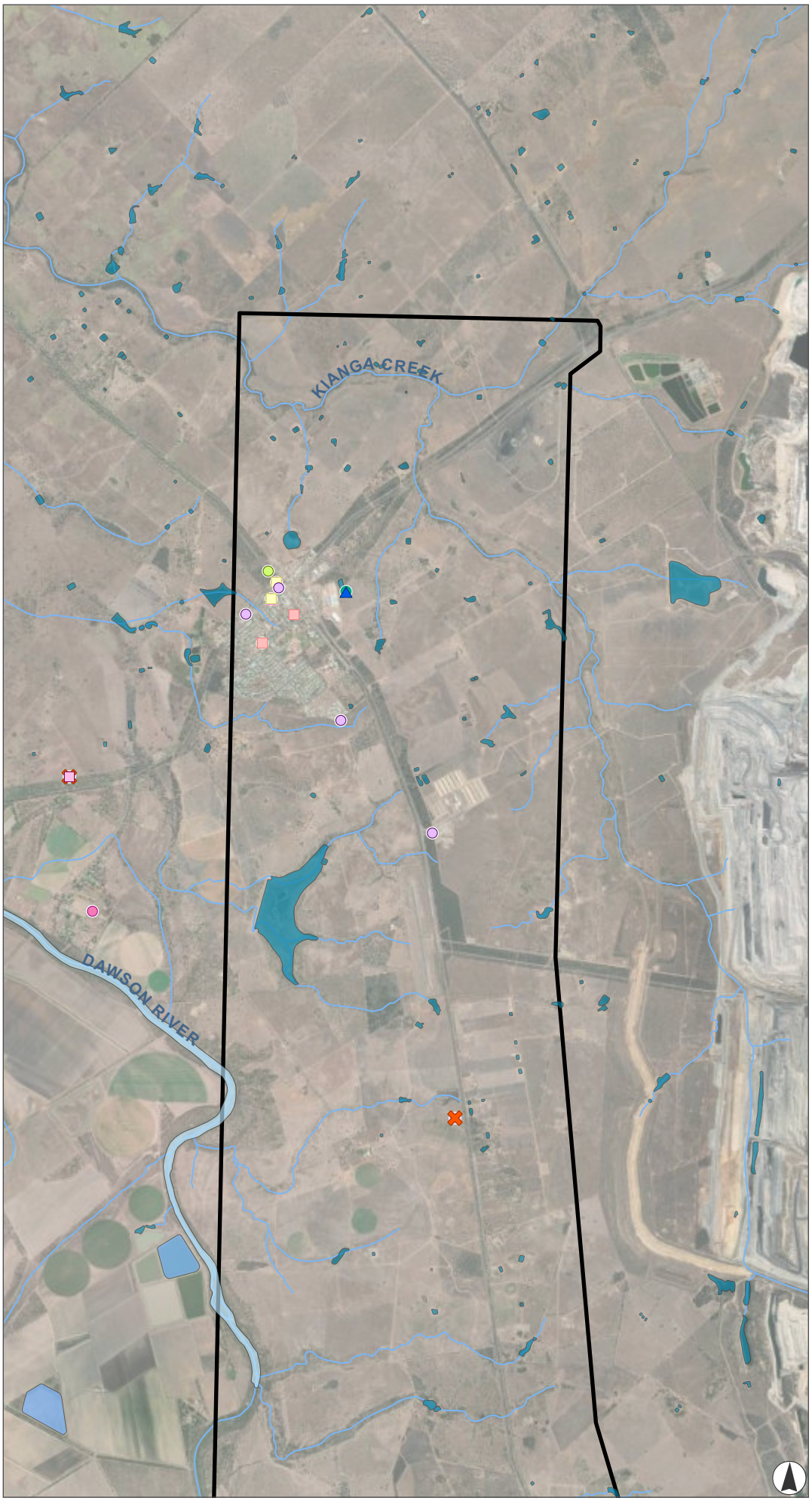


FIGURE 9.11A

Potential Frog Habitat and Records

Legend

- Watercourse
- Project Area

DoR Reservoirs

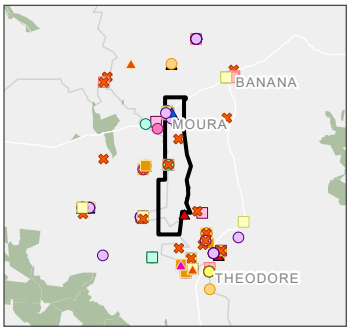
- Flood Irrigation Storage
- Rural Water Storage
- Town Water Storage

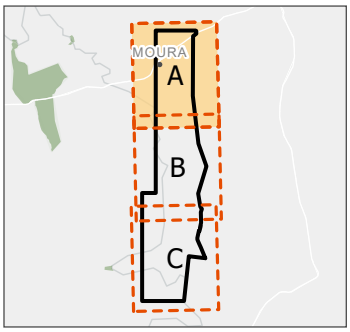
ALA Record of Frogs

- Eastern Dwarf Tree Frog (*Litoria fallax*)
- Green Tree Frog (*Litoria caerulea*)
- Little Red Tree Frog (*Litoria rubella*)
- Northern Banjo Frog (*Limnodynastes terraereginae*)
- Ornate Burrowing Frog (*Platyplectrum ornatum*)
- Peron's Tree Frog (*Litoria peronii*)
- Salmon Striped Frog (*Limnodynastes salmini*)
- Striped Marsh Frog (*Limnodynastes peronii*)
- Wide-mouthed Frog (*Cyclorana novaehollandiae*)

ALA Record of Cane Toads

- Cane Toad (*Rhinella marina*)





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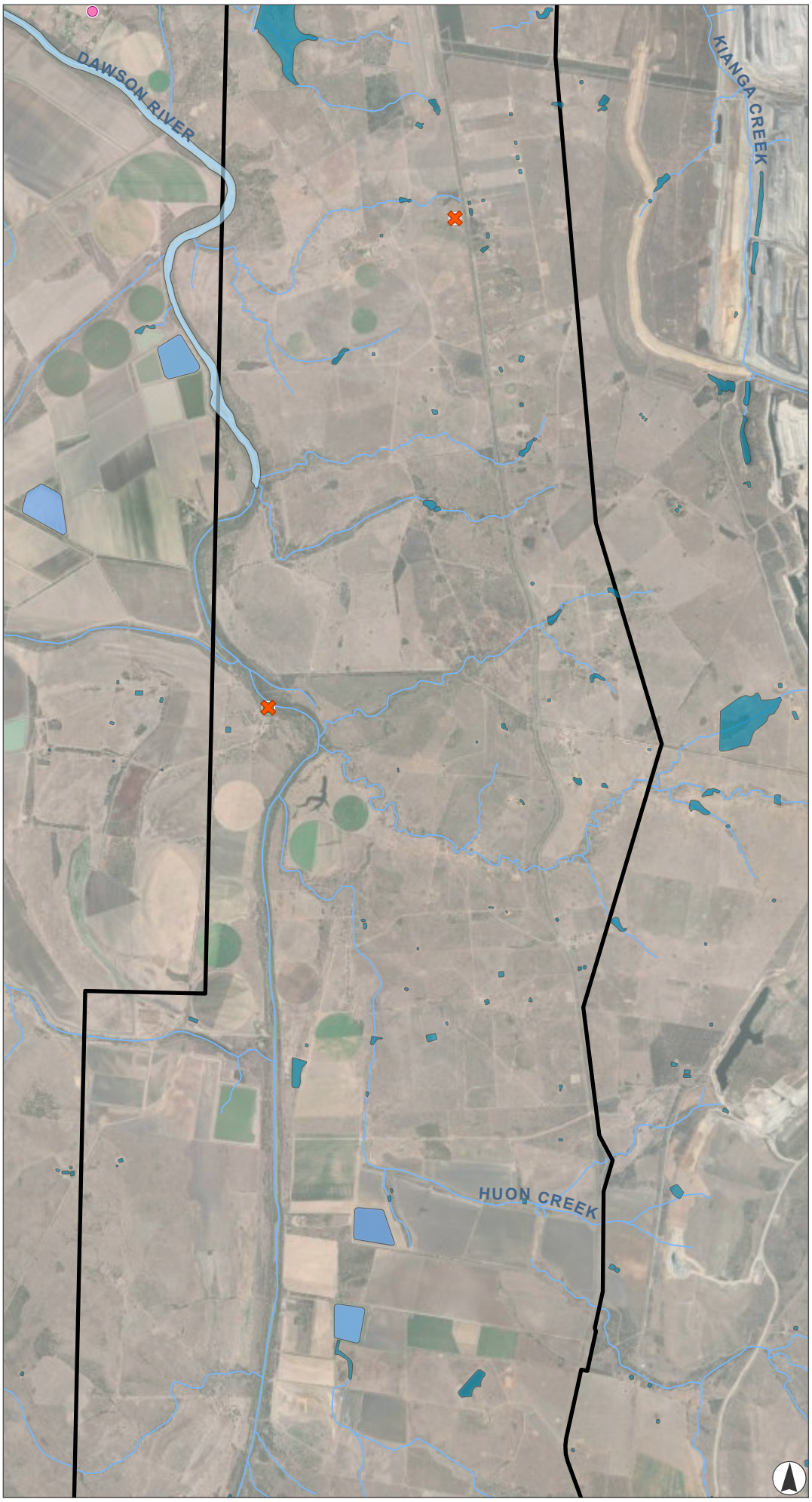


FIGURE 9.11B

Potential Frog Habitat and Records

Legend

- Watercourse
- Project Area

DoR Reservoirs

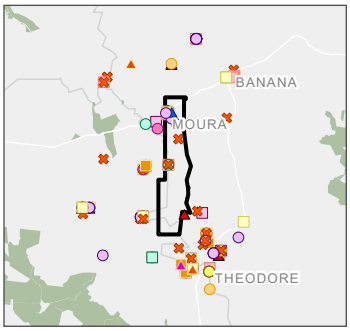
- Flood Irrigation Storage
- Rural Water Storage
- Town Water Storage

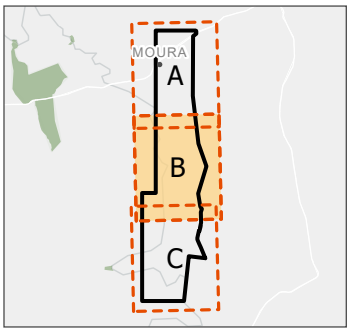
ALA Record of Frogs

- Broad-palmed Frog
- Bumpy Rocket Frog
- Little Red Tree Frog (*Litoria rubella*)
- Ornate Burrowing Frog (*Platyplectrum ornatum*)
- Salmon Striped Frog (*Limnodynastes salmini*)
- Striped Burrowing Frog
- Wilcox's Frog

ALA Record of Cane Toads

- Cane Toad (*Rhinella marina*)





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Kilometres

Scale 1:80,000 at A4
GDA2020 MGA Zone 55

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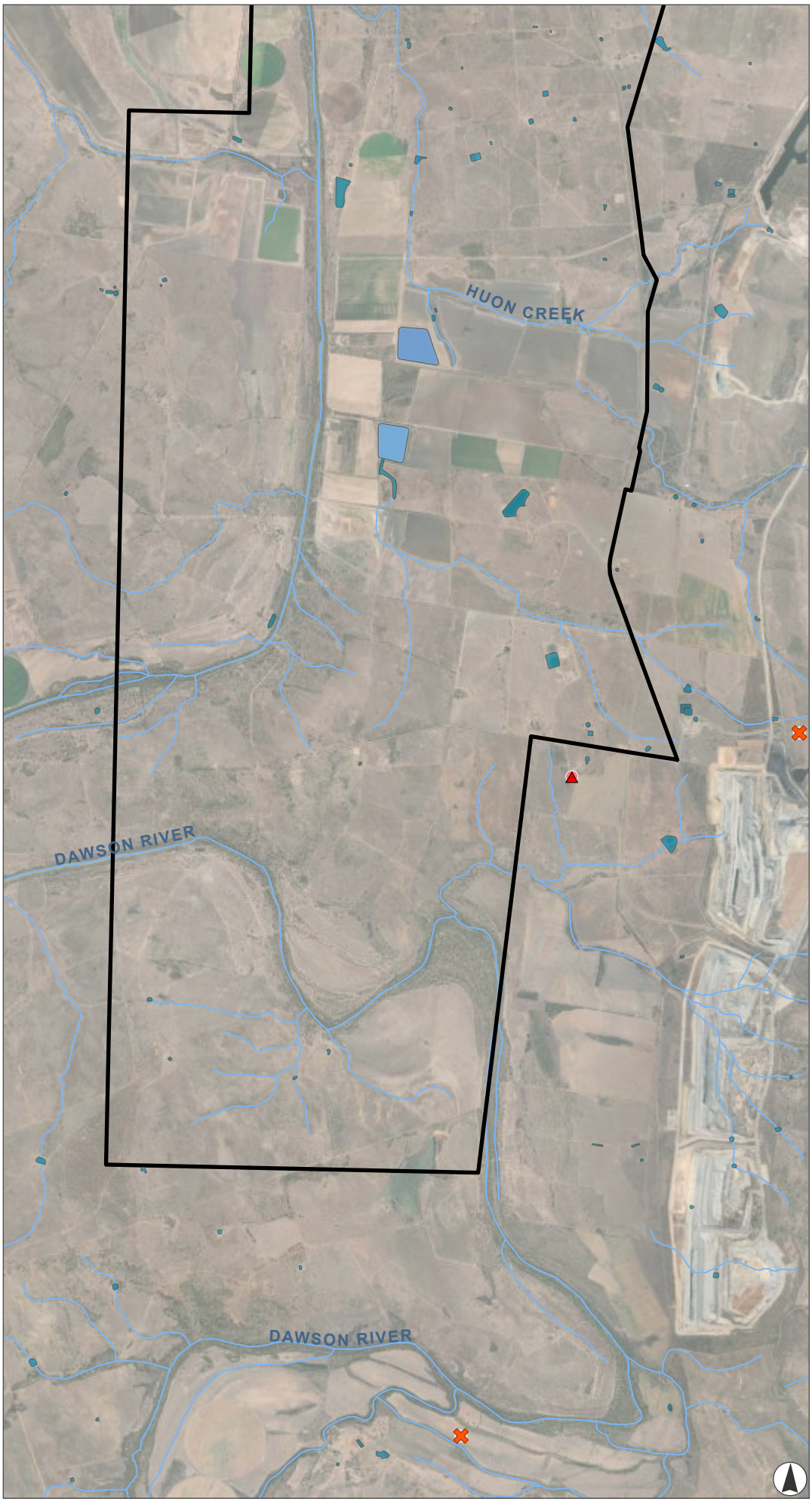


FIGURE 9.11C

Potential Frog Habitat and Records

Legend

- Watercourse
- Project Area

DoR Reservoirs

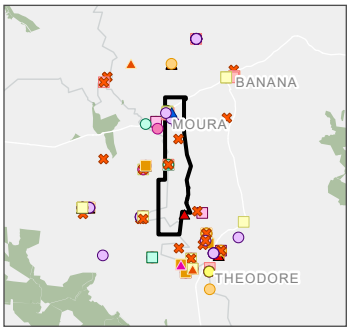
- Flood Irrigation Storage
- Rural Water Storage
- Town Water Storage

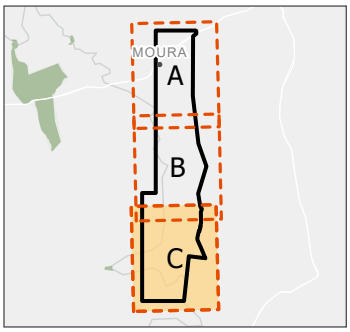
ALA Record of Frogs

- Striped Burrowing Frog

ALA Record of Cane Toads

- Cane Toad (*Rhinella marina*)





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Scale 1:80,000 at A4
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9.10.5 Important Populations

As described on SPRAT, the Commonwealth consider the occurrence of important habitat for the species to be a surrogate for an 'important population' of the species. Important habitat for the ornamental snake is defined in the *Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles* (Department of Climate Change, Energy, the Environment and Water, 2023a) as "gilgai depressions and mounds" with "connectivity between gilgais and other suitable habitats also important".

'Suitable habitat' for the species has also been defined (Department of Climate Change, Energy, the Environment and Water, 2023a) as:

- "Open-forests to woodlands associated with gilgai formations and wetlands. These are commonly mapped as QLD REs 11.3.3, 11.4.3, 11.4.6, 11.4.8, 11.4.9, 11.5.16 or mapped as cleared but where the above REs formerly occurred".

'Suitable habitat' for the ornamental snake can be considered 'important' if it is:

- Habitat where the species has been identified during a survey.
- Near the limit of the species' known range.
- Large patches of contiguous, suitable habitat and viable landscape corridors (necessary for the purposes of breeding, dispersal or maintaining the genetic diversity of the species over successive generations). **Or**
- A habitat type where the species is identified during a survey, but which was previously thought not to support the species.

The species has been recorded within the Project Area. Some areas of suitable habitat identified within the Project Area, including the area where the species was recorded, commonly contain gilgai formations and microhabitat features such as ground timber and soil cracks. These microhabitat features are necessary for the species to persist in the area during dry periods and as such these areas comprise important habitat. However, other areas of suitable habitat that do not support these features may instead afford movement opportunities toward and between water features and areas of gilgai. For these reasons, all suitable habitat is considered important habitat for the species.

9.10.6 Habitat Critical to the Survival of the Species

There are no species-specific guidelines for determining habitat critical to the survival of the ornamental snake, and at present no recovery plan exists. However, important habitat has been defined in the *Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles* and this terminology is considered to be interchangeable with 'habitat critical to the survival of the species' for the purposes of this assessment.

Based on the definition of important habitat defined in the *Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles*, important habitat for the ornamental snake is as "gilgai depressions and mounds" with "connectivity between gilgais and other suitable habitats also important". Based on this definition, all suitable habitat is important habitat for the species.

9.10.7 Potential Project Impacts and Key Mitigation Measures

Over the life of the Project, Westside have committed to a cumulative maximum disturbance of 16.0 ha of suitable habitat.

To ensure patch viability and functionality is maintained at current levels, the siting of Project infrastructure (including wells, gathering infrastructure, tracks and other ancillary infrastructure) within or adjacent to moderate constraint areas (including ornamental snake suitable habitat) will adhere to the following rules:

- Patches that are 0.5 ha or less must be completely avoided by the Project (no direct impacts permitted).
- Patches that are 1.0 ha or less must not be dissected in a way that creates two new patches.
- Direct impacts must not reduce the patch size to less than 0.5 ha OR isolate the patch by more than 50 m to the nearest patch (unless already isolated by more than 50 m).
- Patches >1.0 ha must not be dissected in a way that creates one patch <0.5 ha.

Potential indirect impacts on ornamental snake as a result of the Project include:

- Soil exposure resulting in an increased risk of erosion and sedimentation of water bodies, reducing water quality and degrading aquatic habitats.
- Increased risk of contamination associated with activities such as refuelling or storage of chemicals.
- Temporary changes in hydrology from installation of infrastructure creating a barrier to surface flow and increasing stormwater run-off.
- Removal of water from existing constructed wetlands leading to changes in hydrology / habitat extent and water quality. Increased activity at these locations resulting in avoidance and potentially altered foraging and breeding behaviour.
- Increased pest levels, notably those which may prey upon this species.

General mitigation measures are outlined in **Section 8.2.1**. Mitigation measures specific to ornamental snake are outlined in **Section 8.2.2** and below:

- Ornamental snake individuals and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of ornamental snake habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped).
- Direct impacts to ornamental snake suitable habitat are permitted only to a cumulative maximum disturbance limit of 16.0 ha. Direct impacts to potential ornamental snake habitat will be avoided to the maximum extent possible.

- Where clearing is proposed for areas of ornamental snake suitable habitat, a fauna spotter-catcher must be present. The fauna spotter-catcher will attempt to relocate any ornamental snake individuals that may occur within areas of potential habitat to be cleared to nearby areas of breeding and foraging habitat to be retained (preferably a different habitat patch). This will be done by:
    - Searching for individuals via spotlighting surveys at night. This could be completed the night before works are planned, or at any time within three months of clearing works if conditions are suitable i.e. following rain.
    - Searching for individuals immediately prior to clearing within surface microhabitat such as fallen timber and deep litter piles.
    - Any ornamental snakes captured will be relocated at least 100 m away. The chances of relocated ornamental snake/s returning to areas of habitat to be cleared are considered low as radio tracking studies completed by Veary, (2011) indicate that the species moves only short distances during late summer and winter, and even shorter distances in summer. The species was tracked by Veary (2011) and found to move a total of 54 m from the point of release during a 5-month period.
- Where clearing is proposed within or adjacent to ornamental snake suitable habitat, active erosion and sediment control measures will be implemented to mitigate potential habitat degradation.
- Surface water pipelines design will consider the dispersal requirements of the ornamental snake and be preferentially collocated with access tracks (new or existing) to minimise creating barriers to movement. Where the pipeline is not raised off the ground, egress points that allow ornamental snakes to safely move over or under the pipelines, will be installed (minimum frequency of 1 egress point per 100 m of pipeline).
- Micro-siting of proposed infrastructure will preferentially avoid larger/deeper gilgai or areas with deep soil cracks and fallen timber.
- The period of time that trenches and other excavations are open will be minimised, particularly in areas where the species has been recorded and in mapped suitable habitat.
- To reduce the potential for direct mortality, all vehicles and pedestrians will remain within designated access tracks in areas of ornamental snake habitat.
- To minimise the chances of collision, in known ornamental snake occurrence areas within the Project Area, speed limits will be reduced to 40 km/hr or less and signage will be installed that indicates species presence.
- Larger, discrete surface microhabitat features such as fallen timber and surface rocks will be relocated to adjacent areas of undisturbed habitat prior to clearing, where safe to do so. The fauna spotter-catcher will identify these items prior to clearing and relocation will be supported by machinery as required.
- If an ornamental snake is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days.
- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.

9.10.8 Significant Impact Assessment

The significant impact assessment for this species is presented in **Table 9.21** below. In summary, the assessment found that the Project **has the potential to result in a significant impact on the ornamental snake**, primarily due to the removal of habitat critical to the survival / important habitat above the high-risk significant impact threshold amount of 2 ha as stipulated in the *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (Department of Climate Change, Energy, the Environment and Water, 2023a).

Table 9.21 Significant Impact Assessment – Ornamental snake

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant impact?
Lead to a long-term decrease in the size of an important population of a species	The ornamental snake is known to occur within the northern Project Area, confirmed during targeted surveys which employed spotlighting in accordance with the Commonwealth survey guidance for the species. The Project Area is located within the southern extent of the species known distribution, within a 'likely to occur' area, and several species records occur in the region. As described above, all potential habitat for the species identified within the Project Area is considered to meet the definition of important habitat. As such, the Project Area is likely to support an important population. A total of 4,849.2 ha of suitable habitat is mapped within the Project Area. Approximately half of the ornamental snake habitat present within the Project Area is considered poor quality due to presence of known threats associated with non-remnant vegetation, as a result of historical and ongoing disturbance from cattle grazing and pastural grass incursion. Cane toads also occur commonly across the Project Area. Westside have committed to a maximum cumulative direct impact of 16.0 ha of suitable habitat. Relative to the amount of habitat that will remain, this loss of habitat is considered very minor. Potential indirect impacts on the species including habitat degradation via weed and pest incursion, erosion or sedimentation will be actively managed via Project management plans including but not limited to the SSMP and EMP. Searches for individuals will be conducted by a suitably qualified fauna spotter-catcher in areas of habitat to be cleared, minimising the chances of mortality. No changes in prey availability are anticipated as a result of the Project and prey species (frogs) are persisting in the current modified landscape. Based on the *Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles*, alteration of water quality or quantity affecting four or more hectares of important gilgai or riparian habitat has a high risk of significant impacts on ornamental snake. Additionally, the clearing of two or more hectares of important habitat is considered to have a high risk of significant impact. With the removal of 16.0 ha of suitable habitat that is conservatively considered to all meet the definition of important habitat and the confirmed presence of the species, it is considered possible the Project may lead to a long-term decrease in the size of an important population. To minimise and mitigate Project impacts on the species, a suite of species-specific mitigation measures are proposed (detailed in **Section 8.2.2**).	Possible

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant impact?
Reduce the area of occupancy of an important population	'Area of occupancy' is defined as the area within a species 'extent of occurrence' which is occupied by that species. An important population of ornamental snake is assessed as occurring within the Project Area. Whilst the species is threatened by ongoing habitat destruction, the species has persisted in the landscape of the Project Area throughout times of broad scale land clearing practices, and ongoing agricultural pressures. The removal of up to 16.0 ha of suitable habitat is considered unlikely to reduce the area of occupancy of the species and does not occur at the outer extent of the species extent of occurrence (records). Therefore the Project is unlikely to reduce the area of occupancy of an important population of ornamental snake.	Unlikely
Fragment an existing important population into two or more populations	The ornamental snake's dispersal abilities are not well known. However, existing information on the species (Veary 2011, for example) does indicate that individuals are unlikely to complete large local movements or move outside of mapped habitat (noting their reliance on the presence of appropriate refuge and prey). The siting of infrastructure will maximise opportunities for co-location with other infrastructure and preferentially use areas that are not identified as suitable habitat. All efforts will be made to site infrastructure in a way that does not dissect habitat patches. Surface water pipelines will be preferentially collocated with access tracks (new or existing) to minimise creating barriers to movement. Surface water pipelines design will consider the dispersal requirements of the ornamental snake; where the pipeline is not raised off the ground, egress points that allow safe movement over or under the pipelines will be installed. The species is known from previously cleared areas that are dominated by exotic grass and subject to grazing, as well as areas that contain existing linear infrastructure highlighting the species' ability to utilise fragmented landscapes. Additionally, the majority of proposed Project impacts will be linear in nature, which the species will likely be capable of traversing particularly during periods of inundation. Based on the above, the Project is considered unlikely to further fragment an existing important population.	Unlikely
Adversely affect habitat critical to the survival of a species	*The Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles* states that clearing two or more hectares of important habitat is considered to have a 'high risk of significant impact'. The Project Area is considered to support important habitat for the species, which for the purposes of this assessment is considered the same as habitat critical for the survival of the species. As a result of the Project, a maximum of 16.0 ha of suitable habitat will be directly impacted via vegetation clearing resulting in the loss of approximately 0.33% (16.0 ha) of habitat available within the Project Area. While all the habitat within the Project Area is considered to be important habitat, it should be noted that the majority of these areas are already highly fragmented, impacted by exotic species and in non-remnant condition. Nonetheless, the Project may adversely affect habitat critical to the survival of the species. To minimise and mitigate Project impacts to the species, species-specific mitigation measures are proposed (detailed in **Section 8.2.2**).	Possible

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant impact?
Disrupt the breeding cycle of an important population	The species has live births and as such does not require a specific breeding 'place' such as a nest or den. Young are independent from birth. Nonetheless, important habitat for the species within the Project Area is likely to be utilised for breeding and foraging purposes at suitable times of the year. The Project has a preference to minimise impacts to areas that support deep gilgai as these may support larger numbers of individuals. A maximum of 16.0 ha of suitable habitat will be affected by the Project, however this represents only a very small amount of the total habitat available within the Project Area (0.33%). As such, it is unlikely the Project will disrupt the breeding cycle of an important population.	Unlikely
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	A total of 4,849.2 ha of ornamental snake suitable habitat is mapped within the Project Area comprising areas of remnant, HVR and non-remnant vegetation. As described above, especially where habitat comprises regrowth or non-remnant vegetation, habitat is degraded as a result of historical clearing, cattle grazing, weeds and pests. Regardless of this, the Project is committed to the minimisation of impacts on the species to the greatest extent possible, with a maximum of 16.0 ha of suitable habitat to be affected. This loss of habitat is likely to affects a relatively small population in degraded habitat and is unlikely to trigger the species as a whole to decline in response.	Unlikely
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Contact with cane toads (*Rhinella marina**), predation by feral species and habitat degradation from overgrazing of stock and invasive weeds are recognised threats to the species as per the species' SPRAT profile. Invasive species including the cane toad (*Rhinella marina**) are present across the Project Area and likely common. Invasive weeds such as buffel grass (*Cenchrus ciliaris**) also occur extensively and are common, including within areas of potential habitat as described in the sections above. As the Project Area is largely cleared for agricultural purposes, it is considered likely that many areas already act as conduits for pest movement. The Project will employ best practice control methods for invasive pests including responsible waste management to minimise the attraction of predatory fauna/pest species and the implementation of a weed, pest and biosecurity management plan. Based on this, it is unlikely the Project will result in invasive species that are harmful to the ornamental snake becoming established or exacerbated.	Unlikely
Introduce disease that may cause the species to decline	There are no known diseases affecting the species. Nonetheless, the Project will follow best practice biosecurity protocols during both construction and operation; therefore, introduction of a disease is unlikely. All requirements within the Westside Weed Management Procedure and Biosecurity Management Plan will be implemented to minimise the introduction and spread of pest and weed species.	Unlikely
Interfere substantially with the recovery of the species	A recovery plan for the QLD Brigalow Belt Reptiles, including the ornamental snake, was drafted by WWF-Australia in 2006 (Richardson, 2006). Several actions are identified which generally apply to the following themes: community and government involvement, further research, incentivizing landowners and developing land-management guidelines and fire. There is also the Action Plan for Australian Reptiles (Cogger *et al.*, 1993), which acknowledges that more research into the species is needed in order to define objectives and actions to assist recovery.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant impact?
	The species is known to the Project Area and included in the SSMP, ensuring Project personnel are aware of the species, it's habitat and general sensitivities. The Project is highly unlikely to impede any recovery or research actions relevant to the species.	

9.11 Koala (*Phascolarctos cinereus*)

9.11.1 Status under the EPBC Act

Koala is listed as Endangered under the EPBC Act, effective from 12 February 2022.

9.11.2 Distribution and Habitat Requirements

Koalas are reported to be widespread across QLD, occurring in patchy and often low-density populations across the different bioregions (Department of Agriculture Water and the Environment, 2022b) from the border of NSW in the south to Cairns in the north. The species' distribution is not continuous within its range with a number of populations isolated by cleared land or unsuitable habitat (Department of Agriculture Water and the Environment, 2022b).

Koalas occur in coastal and inland locations and inhabit eucalypt forests and woodlands. Their specialist dietary requirements determine their potential habitat and range distributions. The koala's diet is defined by the availability and palatability of a limited variety of *Eucalyptus, Corymbia* and *Angophora* species in a given region (Department of Agriculture Water and the Environment, 2022b). Patterns in tree preferences are largely driven by the nutritional quality of the trees in a given area and potentially other tree attributes that influence their suitability for resting and/or thermoregulation such as tree size, canopy cover and bark type. Given that the nutritional quality of trees can vary within and between species, a commonly eaten, high nutritional quality food tree species in one area may be less palatable and largely ignored by koalas in another area (Moore and Foley 2000 in Youngentob, Marsh and Skewes, (2021)). The species that are regularly browsed by koala in a particular bioregion and could be considered a substantial portion of the koala's diet are referred to as locally important koala trees (LIKTs) (Youngentob, Marsh and Skewes, 2021). Within the Brigalow Belt Bioregion, 24 *Eucalyptus* species have been identified as LIKTs. An additional 15 species are classified as ancillary habitat trees, which are unlikely to be preferred browse trees, but are likely to make important contributions to koala habitat when they occur in association with LIKTs.
As described in the *National Recovery Plan for the Koala* (Department of Agriculture Water and the Environment, 2022b), koalas use these as shelter trees to thermoregulate, especially during hot days and to avoid predators. Koalas appear to prefer larger and more shady trees for refuge during the day and use a wide range of tree species for shelter including rainforest trees, white cypress pine (*Callitris glaucophylla*), *Callitris columellaris*, brigalow (*Acacia harpophylla*) and black tea-tree (*Melaleuca bracteata*).

Koalas are nocturnal and spend significant periods of time moving across the ground between food and shelter trees. Movement increases in the breeding season (typically September to February). Over a longer timescale, individuals' use of habitat is influenced by seasonal changes in food quality, changes in habitat caused by drought, disturbance history, the long-term results of a changing climate and competition with other species (e.g. bell miner *Manorina melanophrys**) (Department of Agriculture Water and the Environment, 2022b). Home ranges across the species' distribution are highly variable; in QLD and NSW individual home ranges are reported to vary between 3 and 500 ha (Department of Agriculture Water and the Environment, 2022b). Koalas shift between locations for habitat resources in space and time and, therefore, areas can constitute koala habitat even if a koala is not present at a given time (Department of Agriculture Water and the Environment, 2022b).

Koala habitat suitability is based on the availability of the total set of attributes (i.e. presence of feed (i.e. LIKTs) and shelter trees (i.e. ancillary habitat trees), connectivity, proximity to other populations) required by the species to meet its foraging, survival (predator avoidance), growth, movement and reproduction requirements (Department of Agriculture Water and the Environment, 2022b). For an individual koala, these resources include access to sufficient quality food and shelter trees to meet their daily energetic requirements and reproductive needs and a place to avoid predators. In consideration of this, koala habitat will often include:

- Forests or woodlands, especially with a higher proportion of feed tree species, and may include remnant or non-remnant vegetation.
- Roadside and railway vegetation and paddock trees.
- Safe intervening ground for travelling between trees and patches to forage, shelter and reproduce.
- Access to vegetated corridors or paddock trees to facilitate movement between patches.

As described in the species Conservation Advice (Department of Agriculture Water and the Environment, 2022b), climate refugia including patches that are resilient to drying conditions due to favourable hydrological systems can also be important attributes as they are likely to provide a cooler refuge during periods of bushfire and heatwaves.

9.11.3 Threats

The main identified threats to the species are (Department of Agriculture Water and the Environment, 2022b):

- Climate change driven processes and drivers:
    - Loss of climatically suitable habitat.
    - Increased intensity/frequency of drought, heatwave, and bushfire.
    - Declining nutritional value of foliage.
- Human related activities:
    - Clearing and degradation of koala habitat.
    - Mortality from vehicle strike.

- Mortality from dog attack.

- Disease and health:
  - Koala retrovirus (KoRV).
  - Chlamydia (*Chlamydia percorum*).

9.11.4 Occurrence and Potential Habitat

The koala was not recorded during the field survey program. It is considered to have a high likelihood of occurrence within the Project Area and is presumed present for the purposes of this assessment. There is an undated ALA record of koala in the township of Moura, which is located within the north-western Project Area. This record has been sourced from WildNet's (Queensland Wildlife Data) Historical Fauna Database, is unconfirmed and has 1800 m spatial uncertainty. Nonetheless, there are numerous ALA records from the surrounding region, including records in functionally connected habitat associated with the riparian zone of the Dawson River. Of the records within 20 km, the most recent records are from 1997, with the majority from the 1980s.

Records of the species within the WildNet (2024) database are also present and it is likely many of these are the same identified by ALA. A total of 14 WildNet records occur within 20 km of the Project Area, with dates ranging from 1970 to 1997, however all but one record dated 1992 are considered unconfirmed. The spatial uncertainty ranges from 150 m to 9000 m. As per aerial imagery and State RE mapping, most of these records were likely associated with remnant or regrowth alluvial woodland communities, which in many places has since been cleared for cropping.

Potential habitat which is suitable to support the ecological requirements of the species occurs throughout the Project Area. With the exception of habitat associated with the riparian zone of the Dawson River, potential habitat is highly fragmented and exists as disjunct patches in a heavily modified landscape. Habitat which is suitable for the species' breeding and foraging requirements include woodlands in remnant and HVR condition which contain LIKTs. This includes watercourse vegetation on alluvial soils, woodlands on moderately fertile and low fertile soils with koala food trees and acacia-dominated areas with emergent koala food trees.

Although they may also be used for breeding and foraging purposes, select areas of eucalypt forest and woodland on alluvial within the Project Area have the potential to provide future climate refugia for the species. Given the prevalence of agriculture, surface water flows associated with non-perennial watercourses and drainage lines within the main Project Area extent have been substantially modified as a result of historical land use change and clearing. The Dawson River is the only perennial water feature within the Project Area and therefore the only water source likely to provide a reliable resource throughout the year. Water from the Dawson River is periodically diverted to the Offstream Storage by the Moura weir, as described in **Section 6.1.5**. Areas of climate refugia habitat are thus restricted to communities associated with the Dawson River and the Offstream Storage.

The Project Area is interspersed with disjunct patches of *Acacia* dominated woodlands which do not support LIKTs. Although these areas would not contribute substantially to foraging resources, they provide ancillary habitat functions such as shelter for thermoregulation and refuge from predators when dispersing.

In addition to these areas, the Project Area is dominated by historically cleared land used for agricultural purposes including both cattle grazing and intensive cropping. It is recognised that most of this non-remnant vegetation may provide a safe intervening ground for the koala to move across the landscape, between habitat patches. These areas, identified as dispersal habitat, are largely dominated by cleared exotic pasture but may contain rare shrubland areas, sporadic small patches of trees and/or individual paddock trees. The mapping of dispersal habitat is considered conservative as a number of potential barriers to the species' movement are also present including highways, roads, irrigation channels and barbed wire fences.

The extent of mapped koala habitat within the Project Area is provided below in **Table 9.22**, and the mapped habitat is shown on **Figure 9.12**.

Table 9.22 Habitat Extent for Koala

Habitat Utilisation	Habitat Definition	Extent within Project Area (ha)
Climate refugia	Eucalypt forests or woodlands on alluvial associated with permanent water features (dams, wetlands and/or watercourses) that are resilient to drying conditions, likely to provide a cooler refuge during periods of bushfire and heatwaves.	948.6
Breeding and foraging	Any forest or woodland that contains Brigalow Belt 'locally important koala trees' (LIKTs, as described by Youngentob, Marsh and Skewes, (2021)) that is not climate refugia.	801.0
Shelter	Any forest or woodland community which does not contain LIKTs and may or may not contain Brigalow Belt 'ancillary habitat trees' (as described by Youngentob, Marsh and Skewes, (2021)).	800.3
Dispersal	Vegetation that provides a safe intervening ground for the species to move across the landscape (i.e. free from impediments), particularly to and from areas of potential breeding and foraging habitat. This includes non-remnant shrublands and grasslands, which generally support sporadic small stands of trees and/or individual paddock trees. Excludes areas containing infrastructure, active mining areas, cropping, farm dams and other water bodies as well as areas that are physically inaccessible (e.g. exclusion fencing is present).	16,297.0
	Total	**18,846.9**

The koala is not one of the 134 threatened and priority fauna species that has modelling available in the Potential habitat models – fauna 2022 – Queensland GIS data package (DES, 2022). As such, a comparison of the extent of potential habitat mapped within the Project Area against a DES suitability model could not be completed.

Detailed Description of Dispersal Habitat

The following provides an overview of koala dispersal habitat, as evidenced within the Project Area through field survey. This information provides the justification regarding the findings of this assessment, being that the mapped dispersal habitat for the koala is **not** critical to the survival of the species.

Potential habitat for the koala identified as suitable for dispersal only largely aligns with the exotic pasture and other non-remnant vegetation habitat type described in **Section 6.4.6**. The habitat description states that canopy cover and shrub cover is typically sparse to absent. This statement is supported by the findings of the habitat quality survey completed in 2024, which included five BioCondition assessments in representative areas of koala dispersal habitat. Across these five sites, the average canopy cover is 0.5% and the average shrub cover is 1%. Typical tree and/or shrub species that may occur as scattered individuals or clumps of 2–3 individuals include *Atalaya hemiglauca*, *Acacia harpophylla*, *Acacia salicina*, *Carrisa ovata*, *Citrus glauca* and *Grevillia striata*.

To assist in further characterising koala dispersal habitat within the Project Area, particularly the level of vegetative cover supported, a review and analysis of two publicly available vegetation cover datasets was completed. This included the DCCEEW *National Forest and Sparse Woody Vegetation Data* (Version 6.0, 2021 Release) and the Queensland *Statewide Landcover and Trees Study (SLATS) 2022 – woody vegetation extent* mapping was undertaken.

The SLATS 2022 data is the most current version of the mapping available and was published on 12 June 2024. This dataset shows the presence/absence (two categories) of woody vegetation throughout Queensland. The scale of the woody extent dataset is intended to capture features visible at a nominal map scale of 1:10,000: stands of woody vegetation greater than 0.5 ha with a canopy density greater than 10% crown cover will be classified as woody. A minimum width of 20 m applies to linear features. The DCCEEW *National Forest and Sparse Woody Vegetation Data* is similar to SLATS, however it uses three categories of vegetation instead of two: non-woody areas <5% cover, sparse woody vegetation 5–19% and forests (or woody vegetation) >20% cover. For forests, the mapping has incorporated requirements for vegetation height (minimum 2 m tall) and patch size (minimum 0.2 ha).

The SLATS 2022 Woody extent layer was clipped to areas identified as koala dispersal habitat within the Project Area. Of the total extent of dispersal habitat, 1,676.9 ha or 10.3% was identified as containing woody vegetation (i.e. minimum 10% cover which could be canopy or shrub) leaving 14,620.1 ha as non-woody. These areas of vegetative cover within the exotic grassland occur sporadically across the Project Area (**Figure 9.13**). As the DCCEEW *National Forest and Sparse Woody Vegetation Data* is a raster file, analysis was limited to overlaying the image with the koala dispersal habitat mapping (see **Figure 9.14**).

Based on the findings of the field survey program, the areas devoid of vegetation cover (i.e. non-woody) that comprise potential koala dispersal habitat support grassland dominated by exotic pasture grasses such as *Cenchrus ciliaris* (see **Photo 9.2** below). Cattle grazing is considered the dominant agriculture within the Project Area.



Photo 9.2 Representative non-woody koala dispersal habitat

Some areas of 'woody vegetation' identified by the SLATS mapping have been interrogated during the field survey program, resulting in field data that provides insights into the vegetation structure and composition. For example, near the eastern boundary of the central Project Area and adjacent to Theodore Moura Rd, several patches of woody vegetation categorised as dispersal habitat comprise *Citrus glauca* shrubland to open shrubland up to 3 m (see **Photo 9.3**). This species is a hardy shrub, sometimes tree, that has spiny stems with irregularly spaced thorns. Within the Project Area it frequently occurs as sporadic dense thickets, with branches extending from near the base. For this reason, it is highly unlikely to be utilised by koala while dispersing across the landscape.

Near the western boundary of the central Project Area, one patch of woody vegetation categorised as dispersal habitat comprises monotypic *Acacia salicina* open shrubland to 3 m (see **Photo 9.4** left) while another woody patch in this broader area includes *Acacia harpophylla* shrubs to 4 m *(*see **Photo 9.4** right). These areas do not comprise an RE based on both vegetation composition and structure. Furthermore, all field-validated areas of non-remnant vegetation with shrubs were confirmed to have a discontinuous canopy, with shrubs sporadic across the landscape and often clumped.

Finally, in several parts of the Project Area, patches of woody vegetation identified in the SLATS mapping are confirmed to have been recently cleared by the landholder (see **Photo 9.5**). These cleared patches range in size from 0.6 ha to 5.9 ha. As most areas of koala dispersal habitat comprise Category X vegetation under the QLD VM Act, these areas are generally exempt from clearing permits. To maintain the quality of the grazing habitat, landholders in this region will clear woody vegetation regularly.

As shown in **Figure 9.14**, the DCCEEW (2021) *National Forest and Sparse Woody Vegetation Data* identifies very few areas of potential koala dispersal habitat to support sparse woody or woody vegetation. It is also likely that recent clearing is unlikely to have been captured in this dataset.

Based on these findings, it is considered likely that dispersal habitat within the Project Area conservatively supports an average shrub or low tree cover of <5%. Most of the mapped dispersal habitat supports no canopy or shrub cover (>90% of the mapped extent).

Despite the overall lack of habitat opportunities within these areas, Westside have adopted mitigation measures relevant to this habitat categorisation that will ensure habitat continues to provide existing functions.

Through application of mitigation measures, there will be no material change to the dispersal capacity of koala as a result of the Project. The micro siting of infrastructure within dispersal habitat ensures the maximum avoidance and impact minimisation of habitat critical areas that support breeding and foraging, climate refuge and shelter.



Photo 9.3 ***Citrus glauca* shrubland**



Photo 9.4 **Acacia-dominated open shrublands**



Photo 9.5 **Areas of mapped woody vegetation that have been recently cleared, including in the southern Project Area (left) and in the central east Project Area (right)**

Limitations with the SLATS dataset should be noted and may also explain why recently cleared areas are captured. As described in the mapping's metadata, no distinction was made between native and non-native vegetation; woody vegetation such as woody weeds and horticultural crops are included as woody in the final classification. The Project Area is known to support extensive cropping area of the exotic *Leucaena leucocephala** and the inclusion of these areas in the SLATS dataset is unknown. Furthermore, the data set was generated from imagery acquired from Earth-I UK with a specified positional accuracy of 10 m (90% confidence). However, it is likely that imagery used to inform such mapping is as old as 2017, as the source states "A set of pan-sharpened, pre-processed image mosaics acquired between April and November 2017 over Queensland at a resolution of 80 cm was purchased from Earth-I UK".

The presence and extent of habitat for all MNES across the Project Area is considered likely (as evident between field surveys completed for the project) to change over time as a result of ongoing agricultural practices. The field scout process allows for a dynamic assessment of habitat presence and ensures data relied upon to determine impacts is current and reflective of the true on-ground conditions.

9.11.5 Important Populations

While not generally applicable to species listed Endangered under the EPBC Act, the *Conservation Advice for Phascolarctos cinereus (Koala)* (Department of Agriculture Water and the Environment, 2022b) defines important populations of the species. These have been identified as those which are valuable for cultural, social and economic reasons as well as for the species conservation. Important populations for the conservation of the species are those that:

- Have the potential to act as source populations to adjacent areas of suitable, or potentially suitable, habitat.
- Exist in areas of climatically suitable refugia during periods of environmental stress including droughts, heatwaves, and long-term climate change.
- Are genetically diverse.
- Are disease free and/or exhibit low rates of infection with important pathogens.

- Contain genes which may confer adaptation to current and future environmental stressors.
- Are geographical or environmental outliers within the species range.
- Are considered to be important for social, cultural or economic reasons include:
    - Cultural and spiritual importance to Indigenous people.
    - The social value and enjoyment of having koalas close to residential areas.
    - The economic value brought to local business and tourism.
    - The iconic species value at the national and international political and community level.

As described in the sections above, no koalas or evidence of koala presence was identified during the field surveys and the most recent publicly available record in the area is from 1997. Although presence of the species cannot be definitively ruled out, if koalas were to utilise the Project Area, it is likely that this would be limited to a small number of transient individuals, such as males dispersing during the breeding season. This is primarily due to the paucity of recent records in the area and the existing threats that occur including severe habitat fragmentation, and the presence of significant barriers to movement i.e. the adjacent Dawson Mine.

Based on the above definitions, any individuals potentially present in the Project Area would not constitute an important population. However, as the species is listed as Endangered under the EPBC Act, all populations are considered to be 'important' in the context of significant impact assessment (Department of the Environment, 2013b). As such, 'important populations' have not been discussed in the significant impact assessment presented in **Table 9.23**.

9.11.6 Habitat Critical to the Survival of the Species

Potential significant impacts on koala may occur if habitat that is considered to be critical to the survival of the species is adversely impacted. The *Conservation Advice for Phascolarctos cinereus (Koala)* (Department of Agriculture Water and the Environment, 2022b) defines habitat critical to the survival of the species as "the areas that the species relies on to avoid or halt decline and promote the recovery of the species".

For an individual koala, resources necessary for foraging, survival, growth, reproduction and movement include access to sufficient quality food and shelter trees to meet their daily energetic requirements and reproductive needs, and a place to avoid predators. This includes forests or woodlands, road-side and rail vegetation and paddock trees, safe intervening ground matrix for travelling between trees and patches to forage and shelter and reproduce and access to vegetated corridors or paddock trees to facilitate movement between patches (Department of Agriculture Water and the Environment, 2022b).

A population of koalas requires a sufficient total amount of resources within their habitat of adequate quality to support a viable biological population where mortality, survival and recruitment are balanced or recruitment is increasing to optimal carrying capacity and within the bounds of natural fluctuations (Department of Agriculture Water and the Environment, 2022b).

The following factors may be considered when identifying habitat that is critical to the survival of a species:

- Whether the habitat is used during periods of stress (e.g. flood, drought or fire).
- Whether the habitat is used to meet essential life cycle requirements (e.g. foraging, breeding, nesting, roosting, social behaviour patterns or seed dispersal processes).
- The extent to which the habitat is used by important populations.
- Whether the habitat is necessary to maintain genetic diversity and long-term evolutionary development.
- Whether the habitat is necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements.
- Whether the habitat is necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation.
- Any other way in which habitat may be critical to the survival of a listed threatened species or a listed threatened ecological community.

As per the species' Conservation advice (Department of Agriculture Water and the Environment, 2022b), such areas, if identified, would be expected to include habitat occupied and habitat currently unoccupied, areas necessary for population processes and maintenance of genetic diversity and evolutionary potential, and areas required to accommodate future population increase, recolonisation, reintroduction, or as climate refugia.

The Project Area is not currently known to be occupied by koala, however potential habitat of varying quality is present. Habitat which represents climatically suitable refugia is associated with the riparian zone of the Dawson River as it is likely to be resilient to drying conditions and provide a cooler refuge during periods of bushfire and heatwaves. This habitat also provides a dispersal corridor which could support gene flow, a crucial habitat element for koala.

Suitable breeding and foraging habitat has also been identified in areas patches of eucalypt woodland which include LIKTs. Both these habitat types could fulfill the ecological requirements of the species and it is reasonably possible that the habitat may be recolonised and support the species in the future, or already provides important movement corridors in the local area (particularly riparian woodlands associated with the Dawson River).

Shelter habitat, although unsuitable or unfavoured for foraging, may provide ancillary habitat functions such as shelter for thermoregulation and temporary refuge from predators. Based on this, all potential climate refugia, breeding and foraging and shelter habitat mapped in the Project Area is considered to comprise habitat critical to the survival of the species.

There is no data to support the notion that areas within the Project Area identified as dispersal habitat are relied on by the species to avoid or halt decline and promote the recovery of the species. Dispersal habitat as evidenced from considerable field survey effort and presented in this report (**Section 9.11.6**), consists of non-remnant paddocks which have been heavily disturbed by historical clearing for agricultural practices. These areas provide limited ecological function, other than a ground matrix for travelling between mapped habitat patches used for foraging, breeding and shelter. The extent of dispersal habitat between such patches is up to 2.3 km. It is unlikely to be used for dispersal regularly given that individuals would be highly susceptible to predator interactions and limited opportunities to rest and thermoregulate. Furthermore, as the site is brownfield, anthropogenic activity is generally high within areas of potential dispersal habitat increasing the risk of mortality as a result of collision or interaction with feral predators. As such, areas mapped as dispersal habitat are not considered to be critical to the survival of the species.

Further to the above and despite the overall lack of habitat opportunities within these areas, Westside have adopted mitigation measures relevant to this habitat categorisation that will ensure habitat continues to provide existing functions. Through application of mitigation measures, there will be no material change to the dispersal capacity of koala because of the Project. The micro siting of infrastructure within dispersal habitat also ensures the maximum avoidance and impact minimisation of habitat critical areas that support breeding and foraging, climate refuge and shelter.

9.11.7 Potential Project Impacts and Key Mitigation Measures

Over the life of the Project, Westside have committed to a cumulative maximum disturbance of 2.0 ha of breeding and foraging, 6.9 ha of shelter and 400.0 ha of dispersal only habitat. No direct impacts on koala climate refugia habitat are permitted at any time throughout the life of the Project. Direct impacts on koala habitat (breeding and foraging, followed by shelter) will be preferentially avoided and minimised, as per the constraints hierarchy (**Section 8.1**).

To ensure patch viability and functionality is maintained at current levels, the siting of Project infrastructure (including wells, gathering infrastructure, tracks and other ancillary infrastructure) within or adjacent to moderate constraint areas (including koala breeding and foraging habitat and shelter habitat) will adhere to the following rules:

- Patches that are 0.5 ha or less must be completely avoided by the Project (no direct impacts permitted).
- Patches that are 1.0 ha or less must not be dissected in a way that creates two new patches.
- Direct impacts must not reduce the patch size to less than 0.5 ha OR isolate the patch by more than 50 m to the nearest patch (unless already isolated by more than 50 m).
- Patches >1.0 ha must not be dissected in a way that creates one patch <0.5 ha.

The maintenance of habitat functionality within areas of dispersal habitat to be impacted will also be a key consideration in siting infrastructure. As described below, the presence and extent of koala dispersal trees (recognised as a plant of any genera that has a tree diameter that is equal to or greater than 10 cm when measured at 1.3 m above the ground (referred as >10 cm DBH)) will be assessed and considered as part of the field scout process, as it is acknowledged that these trees are the primary habitat resource within these areas. Of the 400 ha limit for dispersal habitat, 1% (or 4 ha) may comprise koala dispersal trees measured by canopy cover. This loss of koala dispersal tree cover as a result of the Project will be so minor, and so evenly distributed across the Project Area that it is considered highly unlikely habitat function will be disrupted.

Although the total area of dispersal habitat that may be impacted is relatively large, it should also be noted that dispersal habitat for the species occurs extensively within the Project Area and predominantly comprises historically cleared land that is subject to ongoing agricultural activity including slashing, scrubbing and blade ploughing. When the dispersal habitat impacted comprises only exotic pasture (which will predominantly be the case), direct impacts will be temporary in nature. This is because the infrastructure location is rehabilitated immediately following the completion of construction and through rehabilitation, the area is essentially returned to its previous state and the habitat function is reinstated.

Potential indirect impacts on koala as a result of the Project include:

- Degradation of habitat through exacerbation of exotic agricultural species, such as buffel grass.
- Increased predation by feral animals including wild dogs.
- Increased risk of vehicle or plant collision resulting in mortality.

General mitigation measures are outlined in **Section 8.2.1**. Mitigation measures specific to koala are outlined in **Section 8.2.2** and below:

- Koala individuals and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of koala habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped).
- No direct impacts to koala habitat categorised as climate refugia will be permissible at any time throughout the life of the Project.
- As the majority of the Project Area is mapped as some form of koala habitat (predominantly dispersal habitat which comprises non-remnant vegetation), direct impacts on the species are largely unavoidable. Siting of infrastructure will preferentially retain breeding and foraging habitat (which contains key habitat resources and may fulfil lifecycle requirements) over shelter and dispersal habitat.
- Direct impacts to koala breeding and foraging habitat are permitted only to a cumulative maximum disturbance limit of 2.0 ha. Direct impacts to koala shelter habitat and dispersal habitat are permitted only to a cumulative maximum disturbance limit of 6.9 ha and 400.0 ha respectively. Of the 400 ha limit for dispersal habitat, 1% (or 4 ha) may comprise koala dispersal trees measured by canopy cover.

- During the field scouts, the presence and extent (measured by canopy cover) of koala dispersal trees (recognised as a plant of any genera that has a tree diameter that is equal to or greater than 10 cm when measured at 1.3 m above the ground (referred as >10 cm DBH)) within areas of koala dispersal habitat with be assessed as part of habitat verification and mapping. This data will be used to provide guidance on micro-siting and inform the site-specific determination of impacts to dispersal habitat (including area of dispersal tree cover loss predicted). The subsequent field scout ecology report will detail the findings and include an assessment of predicted residual changes to koala dispersal capacity as a result of the Project, relative to the baseline. No functional loss of koala dispersal habitat will be permitted.

- The micro-siting of Project infrastructure within areas of koala dispersal habitat proposed for clearing will prioritise the retention of koala dispersal trees (highest priority) followed by any native woody vegetation.

- Within areas of koala breeding and foraging habitat to be cleared, micro-siting will aim to maximise the retention of Brigalow Belt Locally important koala trees, as defined in *A review of koala habitat assessment criteria and methods* (Youngentob, Marsh and Skewes, 2021).

- Within areas of koala shelter habitat to be cleared, micro-siting will aim to maximise the retention of Brigalow Belt ancillary koala trees, as defined in *A review of koala habitat assessment criteria and methods* (Youngentob, Marsh and Skewes, 2021).

- Clearing must be carried out in a way that ensures any koala present have time to move out of the clearing site without human intervention.

- Where clearing is proposed for areas of koala habitat (breeding and foraging and shelter habitat categories), a fauna spotter-catcher must be present. Prior to vegetation clearing commencing, the fauna spotter-catcher will include canopy searches for koalas. If a koala is located during clearing activities:

    - The individual must not be forcibly relocated.

    - Any tree which houses a koala as well as any tree with a crown that overlaps that tree will not be cleared until the koala vacates the tree on its own volition.

    - Allow a clearing buffer surrounding the tree, equal to the height of the tree or deemed suitable by the fauna spotter-catcher.

    - Any injured koala (and fauna in general) should be transported to a vet or recognised wildlife carer.

    - Requirements for koalas subject to handling to be examined and if suspected of Chlamydia infection will be taken to a predesignated veterinarian/wildlife care facility for treatment prior to release.

- To reduce the potential for direct mortality, all vehicles and pedestrians will remain within designated access tracks in areas of koala habitat.

- To minimise the chances of collision, in known koala occurrence areas, speed limits (in private areas) will be reduced to 40 km/hr or less and signage will be installed that indicates species presence. It is noted that the species is currently considered a potential occurrence and is not known to the Project Area.
- If a koala is sighted within the Project Area, the details of this observation will be communicated via the daily toolbox and on notices in the common areas of the site office in order to increase vigilance in the area and compliance with enforced speed limits.
- In the unlikely event that a koala is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days.
- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.

9.11.8 Significant Impact Assessment

The significant impact assessment for this species is presented in **Table 9.23** below. In summary, the assessment found that the Project is **may result in a significant impact on the koala**.

Table 9.23 Significant Impact Assessment – Koala

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant impact?
Lead to a long-term decrease in the size of a population	No koalas or evidence of koala presence was identified during the field surveys and the most recent publicly available record in the area is from 1997. Although presence of the species cannot be definitively ruled out, if koalas were to utilise the Project Area, it is likely that this would be limited to a small number of transient individuals, such as males dispersing during the breeding season. This is primarily due to the paucity of recent records in the area and the existing threats that occur including severe habitat fragmentation, and the presence of significant barriers to movement i.e. the adjacent Moura Mine. The majority of the Project Area is considered to support a matrix of potential habitat. However the vast majority is suitable for dispersal only and does not contain habitat elements necessary for the breeding, foraging, refuge or shelter requirements of the species. The habitat of the greatest value is mapped as climate refugia which includes eucalypt forests and woodlands in the riparian zone of the Dawson River. The habitat supported by the Dawson River includes numerous LIKTs and REs known to support the species and may also comprise an important dispersal corridor which could contribute to gene flow at the metapopulation scale. The ecological significance of this habitat type is recognised and as a result, it will be completely avoided (i.e. 0.0 ha limit). Breeding and foraging habitat is present throughout the Project Area, primarily in disjunct patches in a highly fragmented landscape, although in some locations this is connected to climate refugia habitat. This habitat type contains LIKTs and presents the next highest value habitat for the species behind climate refugia. Although habitat may provide the resources necessary for the species ecological requirements, it is not considered highly unique or important given that patches are typically small and disconnected.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant impact?
	This habitat will be avoided as a priority, however a maximum of 2.0 ha of breeding and foraging habitat may be directly impacted over the life of the Project. Shelter habitat exists primarily as fragmented patches of vegetation surrounded by highly modified paddocks (dispersal habitat) and is more common that breeding and foraging habitat. This habitat is not considered to be of high value as it does not contain preferred foraging species, but may provide ancillary habitat functions such as thermoregulation and temporary refuge from predators for dispersing animals. A maximum of 6.9 ha of this habitat may be impacted by the Project. Habitat suitable for dispersal comprises historically cleared, exotic grassland that is frequently devoid of trees. The micro-siting of Project infrastructure within areas of koala dispersal habitat proposed for clearing will prioritise the retention of koala dispersal trees (highest priority) followed by any native woody vegetation. Of the 400 ha limit for dispersal habitat, 1% (or 4 ha) may comprise koala dispersal trees measured by canopy cover. During the field scouts, ecologists will assess the presence and extent (measured by canopy cover) of koala dispersal trees (recognised as a plant of any genera that has a tree diameter that is equal to or greater than 10 cm when measured at 1.3 m above the ground (referred as >10 cm DBH)) within areas of dispersal habitat. The loss of koala dispersal tree cover as a result of the Project will be so minor, and so evenly distributed across the Project Area that it is considered highly unlikely habitat function will be disrupted (ensuring no functional loss of habitat despite some vegetation clearing). Indirect impacts on the species as a result of the Project are expected to be limited. The Project is highly unlikely to increase or introduce pests as many are known to occur already and existing conduits for movement are present. Due to an increase in activity onsite during the construction period especially, the risk of vehicle strikes will be increased. The Project EMP and SSMP will be implemented and include a suite of koala specific mitigation measures including speed limits. The species likely occurs a low density population and therefore the use of the Project Area at any one time is likely limited to a very small number of individuals. Noting this, the low magnitude of habitat loss as well as the implementation of species-specific mitigation measures, a long-term decrease in the size of a population is unlikely to result from the Project.	
Reduce the area of occupancy of the population	As stated in the species' Conservation Advice, the area of occupancy (the area within the species' distribution that is occupied by the species) for the koala is estimated at 19,428 km^2 and is contracting. It is noted that the area of occupancy may be potentially overstated given the low resolution in the mapping methodology used by the Commonwealth (2 km x 2 km grid). The koala is widespread across QLD and the Project Area is not located near the limit of the species distribution. Although the Project would result in the removal of up to 408.9 ha of habitat (of which 400 ha is predominantly exotic grassland suitable for dispersal only), the area of occupancy of the species would not be reduced by the Project, based on the Commonwealth's mapping methodology – i.e. the 2 km x 2 km grids encompassing the Project would be expected to remain occupied if the species is present.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant impact?
	At a finer scale, the area of occupancy of any local population or metapopulation is highly unlikely to be reduced, also noting that individual males have been known to travel distances of up to 20 km. The highest value habitat present (climate refugia) will be completely avoided and the nature and scale of clearing within breeding and foraging habitat, shelter habitat and dispersal habitat will not result in a significant change in habitat function or reduction in carrying capacity. It is expected that the quantum of potential habitat that will remain in the Project Area and surrounding region would maintain the current level of metapopulation processes. Based on this, Project works are considered unlikely to materially reduce the availability or quality of habitat for the species to the extent that the area of occupancy would be reduced.	
Fragment an existing population into two or more populations	The species is considered highly mobile and known to readily move across cleared areas (Youngentob, Marsh and Skewes, 2021). Koalas, particularly subadult males, have been recorded to disperse across distances of up to 20 km (Norman et al., 2019). Habitat within Project Area is already highly fragmented (with the exception of the Dawson River riparian corridor) due to historical clearing and agricultural practices. Several existing barriers to movement are present both outside of the Project Area (include the Dawson Mine to the east) and within the Project Area, including numerous roads and highways, irrigation channels, and intensive use areas some of which have exclusion fencing. No vegetation clearing will occur within the riparian vegetation of the Dawson River (which may be used as a key movement corridor) and use of existing cleared areas would be maximised to limit further habitat fragmentation. Once constructed, the Project itself will not create a barrier to movement as ground surfaces will be reinstated and fencing will only be constructed around well pads which will occur in discrete locations. As a priority, any isolated mature trees within dispersal habitat will be retained. As such, no significant patch isolation will occur indicating that landscape connectivity, would not be reduced from the current condition. During construction, increased vehicle activity and ground excavations may present temporary barriers to movement. The risk of entrapment and collision will be actively managed via the EMP. Given the ability for this species to readily disperse across non-remnant areas, vegetation clearance associated with the Project is unlikely to present significant barriers to this species local movement, to the extent that it fragments any population of this species within the Project Area.	Unlikely
Adversely affect habitat critical to the survival of a species	As described in the section above, potential habitat comprising climate refugia, breeding and foraging and shelter broadly meet the definition of habitat critical to the survival of the species. While the Project Area is not known to support a population of the species, the Conservation Advice includes currently 'unoccupied' areas in the definition of habitat critical to the survival of the species.	Possible

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant impact?
	Climate refugia mapped in associated with the riparian zone of the Dawson River provides the highest value habitat for the species, with large connected areas, numerous LIKT dominated communities and a potential dispersal corridor at the landscape scale. The ecological value of this habitat is recognised and hence a commitment of 0.0 ha of impact has been made. Only directional drilling would be permitted within the riparian corridor, meaning the key movement corridor and habitat refuge for the species would be retained. Although, habitat critical to the survival of the species would be preferentially avoided, a maximum of 2.0 ha of breeding and foraging habitat and 6.9 ha of shelter habitat may be impacted as a result of the Project. This impact will occur over the life of the Project, and likely in small, isolated areas, i.e. patch edges rather than removing or dissecting patches. Although the magnitude of habitat loss is very low, it is noted that habitat of this nature across the local area has been significantly reduced as a result of historical clearing. It is unclear to what extent the species is relying on the presence of these areas to maintain foraging opportunities. As such, it is considered possible that this loss of critical habitat may have an adverse impact on the species in the local region.	
Disrupt the breeding cycle of a population	No population of this species is known to occur within the Project Area, and if present individuals are expected to occur in very low densities. Male koalas are known to disperse large distances during the breeding season in search of a mate. The shape and scale of clearing would not create barriers to movement that would hinder this dispersal. Further, construction works will be completed during daylight hours wherever possible which will minimise impacts from construction light and noise (i.e. masking male koala calls during the breeding season). Given the potential absence or infrequent use of the Project Area by this species, the Project is unlikely to disrupt the breeding cycle of a population.	Unlikely
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The species has very broad habitat requirements and can inhabit vegetation in varying condition, including non-remnant. A maximum of 2.0 ha of breeding and foraging habitat, 6.9 ha of shelter habitat, and 400.0 ha of dispersal habitat could be directly impacted as a result of the Project. The breeding and foraging habitat is not considered highly unique or important for refuge and habitat with similar characteristics, quality and condition occurs widely within the region. It also occurs primarily as disjunct patches in a highly fragmented landscape with significant dispersal barriers present. Identified dispersal habitat is considered to be of low value to the species, given the significant presence of threats and impediments. Habitat features that may be important for movement such as individual paddock trees are rare, and often comprise small regrowth trees that would not offer thermoregulation. As a priority, any isolated mature trees within the dispersal habitat will be retained. The area of tree canopy that may be lost as a result of clearing within dispersal habitat (4 ha) is such a low percentage of available habitat, and will be so evenly dispersed across the final impact area that it will not affect the functional value of the habitat to the koala. Therefore any project works in this area is likely to have a negligible impact on the species as the Project will not create any barriers to movement and habitat will be immediately reinstated immediately following construction ensuring movement continues to be facilitated. Clearing will only be conducted as strictly necessary. Climate refugia habitat which is likely to be of greatest value to the species will be strictly avoided.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant impact?
	Micro-siting of infrastructure in breeding and foraging and shelter habitat will aim to retain large trees and maximise the use of existing gaps. It is recognised that potential indirect impacts on habitat that will be retained may occur as a result of the Project including habitat degradation from increased dust, edge effects, weeds and temporary altered hydrology. Indirect impacts will be actively managed via Project management plans and include measures such as erosion and sediment control, dust suppression and weed and pest management. The local population is likely to be low-density with individuals utilising the Project Area infrequently. Given this, the avoidance of climate refugia habitat and minimisation of impacts to other habitat types, and the suite of mitigation measures, it is unlikely that the Project will alter habitat to the extent where the species is likely to decline.	
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	A number of exotic fauna species were identified within the Project Area during the field surveys. Although wild dog was not recorded during field surveys, the species is expected to occur within the Project Area and surrounding region. As the Project Area is largely cleared for agricultural purposes, it is considered likely that many areas already act as conduits for pest movement. The Project will employ best practice control methods for invasive pests including responsible waste management to minimise the attraction of predatory fauna/pest species and the implementation of a weed, pest and biosecurity management plan. Based on this, it is unlikely the Project will result in populations of invasive species that are harmful to the koala becoming established or exacerbated.	Unlikely
Introduce disease that may cause the species to decline	Chlamydia and Koala Retrovirus (KoRV) are known threats to the species. The Project will follow best practice construction and operational methods; therefore, introduction of a disease is unlikely. Chlamydia and KoRV are known threats to the species. Chlamydia and KoRV are found in most koalas and many live with the infections and never show outward signs of illness or suffer measurable reproductive consequences (Youngentob, Marsh and Skewes, 2021). These common pathogens can progress to clinical disease when influenced by factors that cause chronic stress, including habitat loss. Chronic stress to koalas is also thought to increase their susceptibility to contracting disease as their immune systems can be negatively impacted. Where chronic stress is widespread in a population, for example in marginal habitat or urban areas, it is possible that loss of fertility due to disease and reduced recruitment due to habitat fragmentation could cause populations to decline (Department of Agriculture Water and the Environment, 2022d). No koalas are known from the Project Area and habitat is typically of low value, with the exception of the Dawson River riparian zone and some larger patches which contain LIKTS. The extent of koala habitat that would remain would retain its ecological function and provide opportunities for koalas to seek refuge from disturbance during construction. Should an unwell koala be identified during clearing works, it will be handled appropriately by a qualified spotter-catcher and taken to a predesignated veterinarian/wildlife care facility for treatment prior to release. Best practice biosecurity measures will also be implemented through the Biosecurity Management Plan. Further, Project works are unlikely to lead to new pathways to disease dispersal into the Project Area for any individuals which may carry the disease.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant impact?
	Based on the above, it is considered highly unlikely that Project activities are of the magnitude that would result in a population level decline from introduction or exacerbation of disease. Diseases which may impact the health of eucalypt ecosystems may indirectly affect the koala via decline in habitat quality (i.e. myrtle rust and *Phytophthora cinnamomi*). These pathogens are easily spread by a range of vectors including wind, animals and humans. The Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan will include relevant guidelines to control these pathogens, such as vehicle washdown procedures, contractor education and revegetation plant species and materials being obtained from a reliable source that is certified free of pathogens. Any Project equipment sourced from international origins will be subject to State and Commonwealth quarantine protocols. With the successful implementation of the above controls, it is considered highly unlikely that Project activities would introduce these pathogens to the Project Area.	
Interfere substantially with the recovery of the species	A National Recovery Plan for the Koala was published in 2022. The goal of the Recovery Plan is to stop the trend of decline in population size by having resilient, connected and genetically healthy metapopulations across its range and to increase the extent, quality and connectivity of habitat occupied. In meeting this goal, four main objectives are detailed: • Stabilise and then increase the area of occupancy and size of populations that are declining. • Maintain or increase the area of occupancy and size of populations that are stable. • Metapopulation processes are maintained or improved. • Partners, communities and individuals have a greater role and capability in koala monitoring, conservation and management. There is limited information available about the koala population viability and trend within the Moura region. While it is likely only a portion of the local population may utilise the mapped habitat, the Project is unlikely to alter overall population numbers, dynamics or occupancy areas. Recognised threats to the species are also unlikely to be significantly increased or exacerbated by the Project. Based on this, the Project is unlikely to interfere substantially with the recovery of the species.	Unlikely

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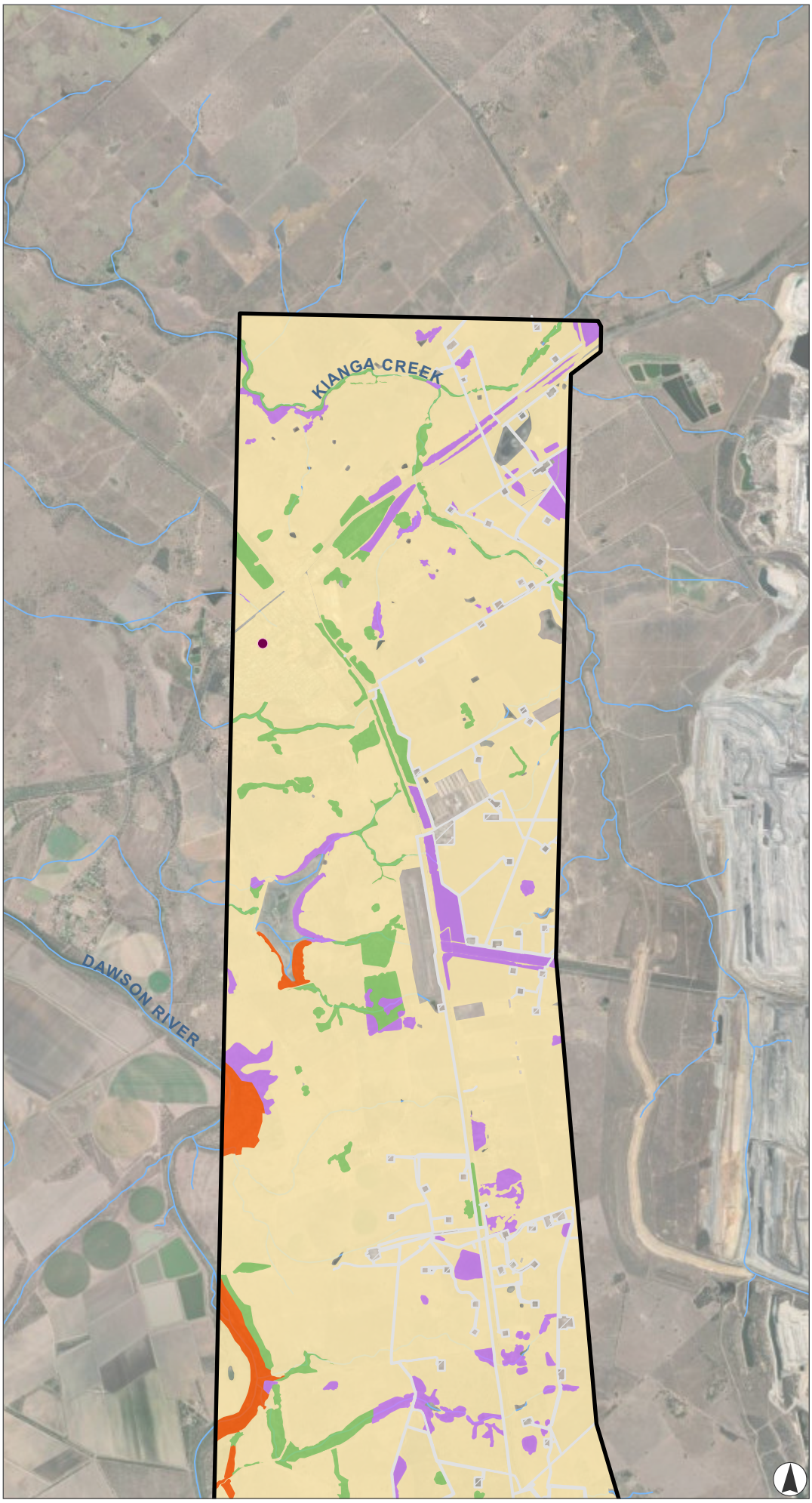


FIGURE 9.12A

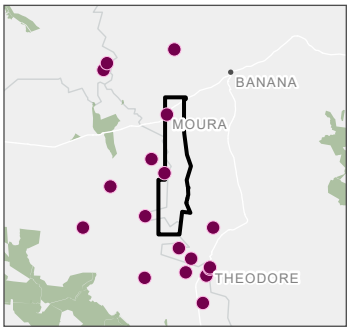
Koala *(Phascolarctos cinereus)* Habitat and Records

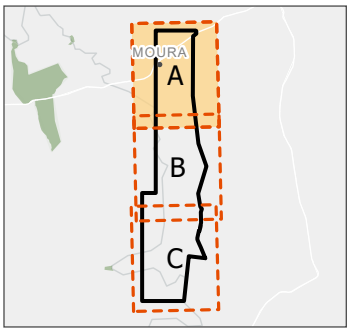
Legend

- ALA Records of Koala
- Watercourse
- Project Area
- Existing Westside infrastructure

Koala Habitat

- Breeding and foraging
- Climate refugia
- Dispersal
- Shelter vegetation





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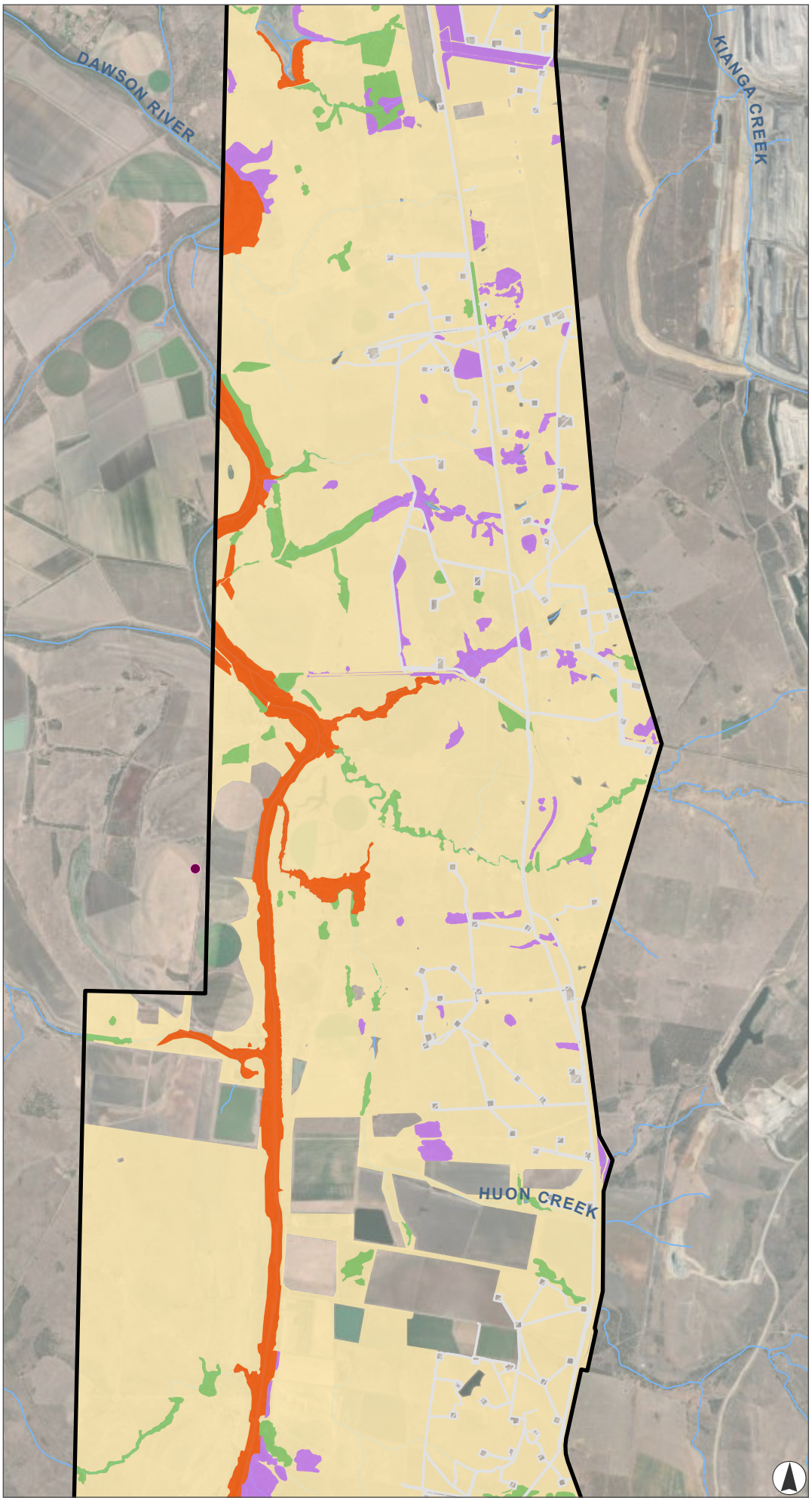


FIGURE 9.12B

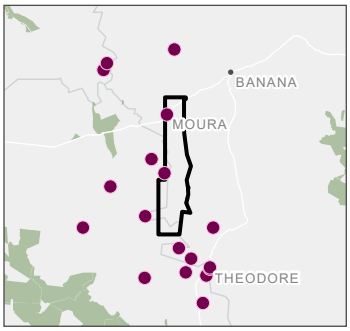
Koala *(Phascolarctos cinereus)* Habitat and Records

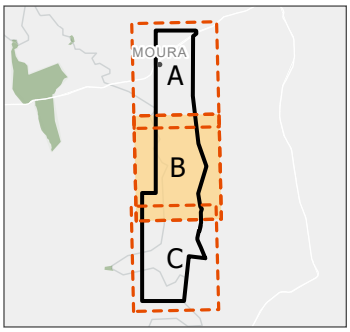
Legend

- ALA Records of Koala
- Watercourse
- Project Area
- Existing Westside infrastructure

Koala Habitat

- Breeding and foraging
- Climate refugia
- Dispersal
- Shelter vegetation





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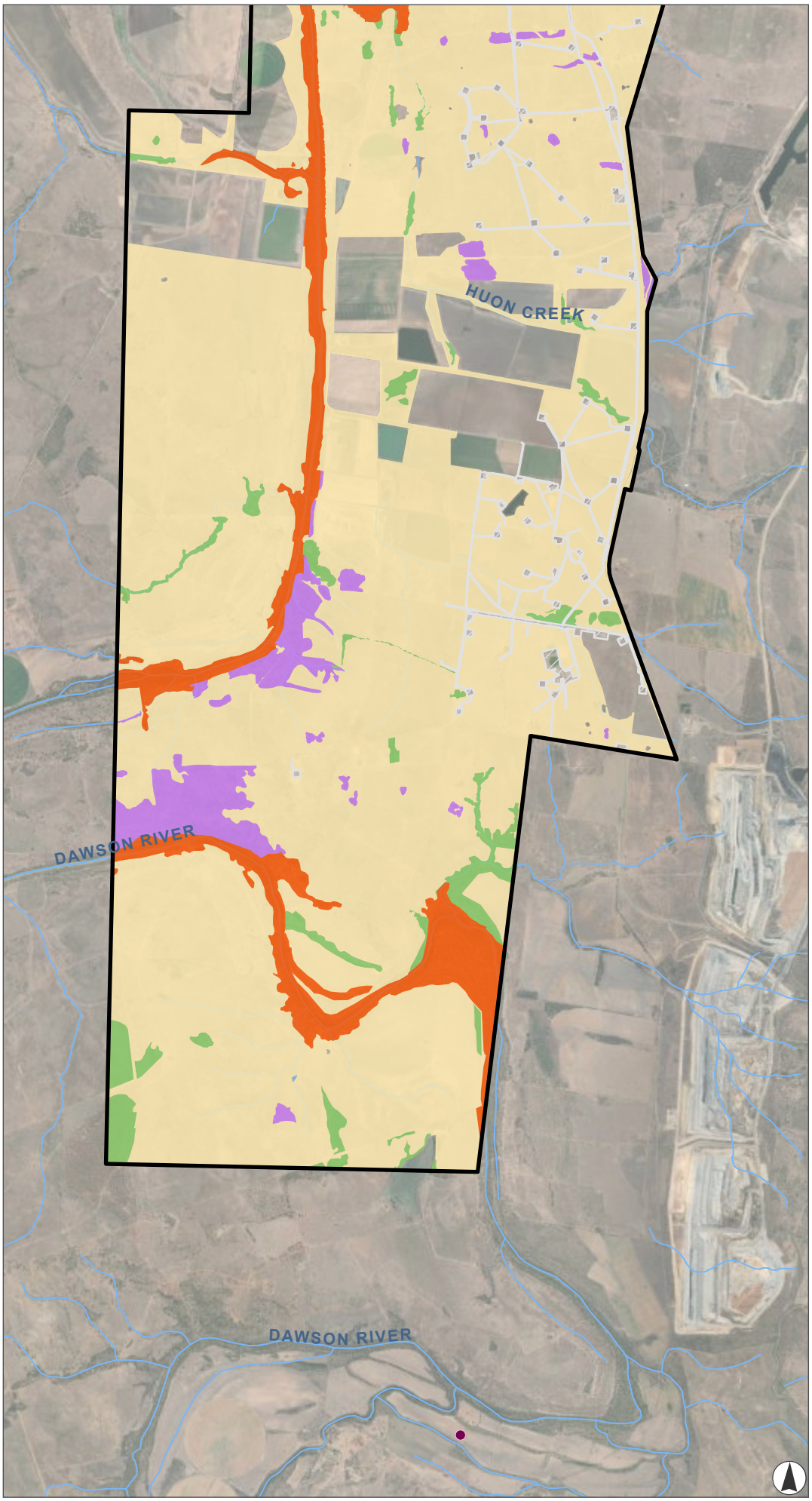


FIGURE 9.12C

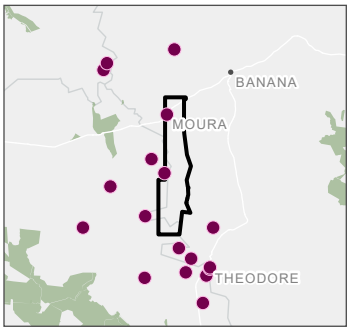
Koala *(Phascolarctos cinereus)* Habitat and Records

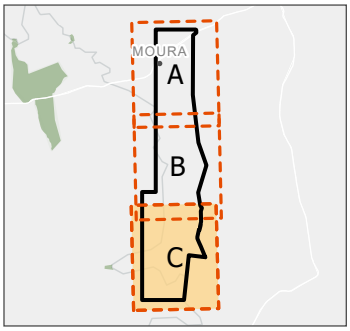
Legend

- ALA Records of Koala
- Watercourse
- Project Area
- Existing Westside infrastructure

Koala Habitat

- Breeding and foraging
- Climate refugia
- Dispersal
- Shelter vegetation





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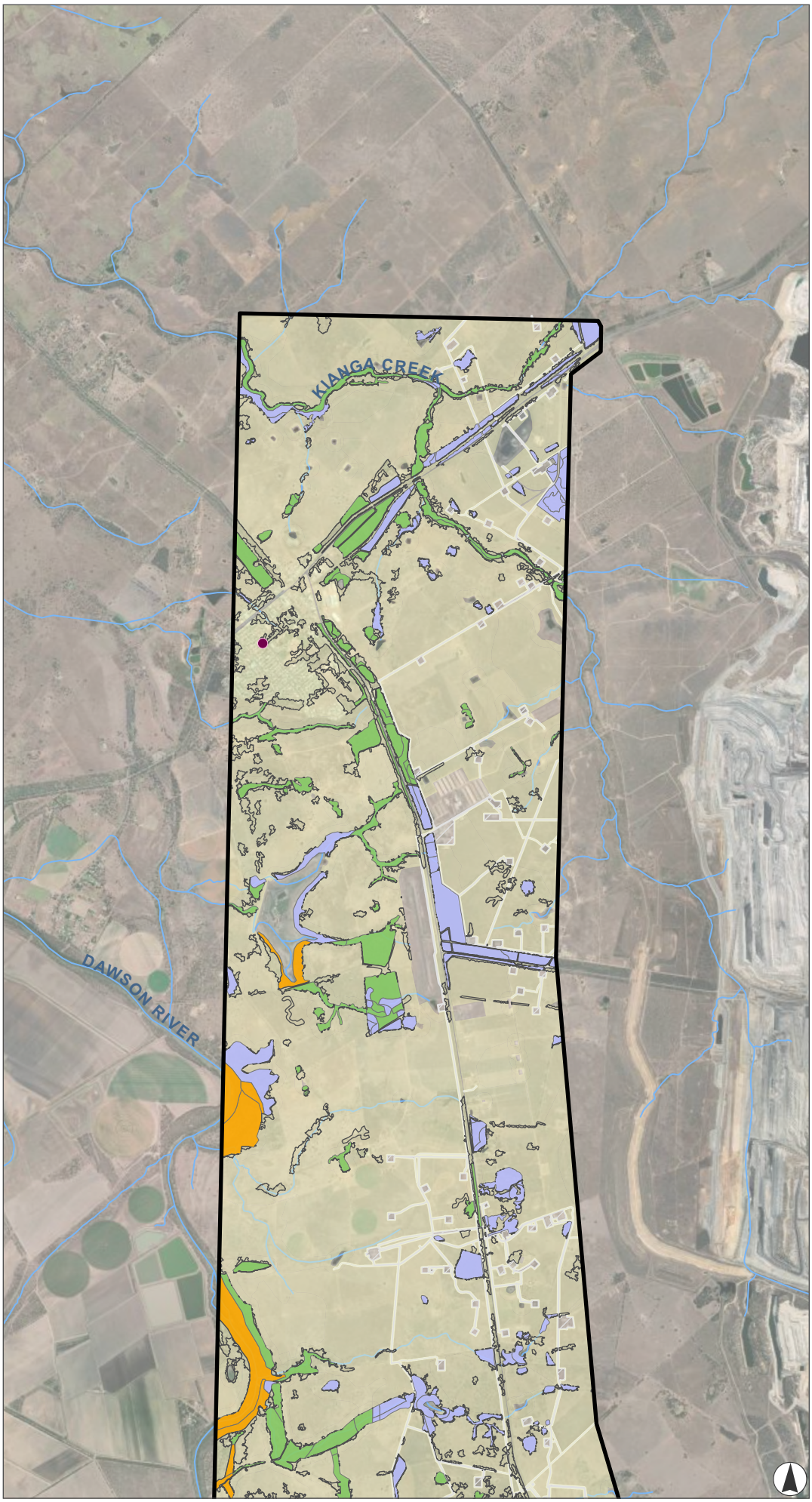


FIGURE 9.13A

Koala *(Phascolarctos cinereus)* Dispersal Habitat with SLATS Woody Areas

Legend

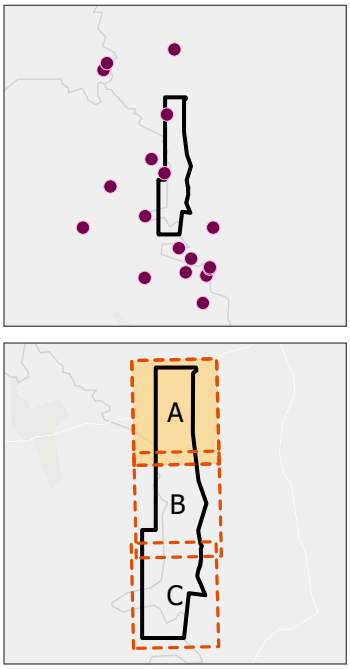
- ALA Records of Koala
- Watercourse
- Project Area
- Existing Westside infrastructure

SLATS 2022

- Woody vegetation (>10% cover) in koala dispersal

Koala Habitat

- Breeding and foraging
- Climate refugia
- Shelter
- Dispersal



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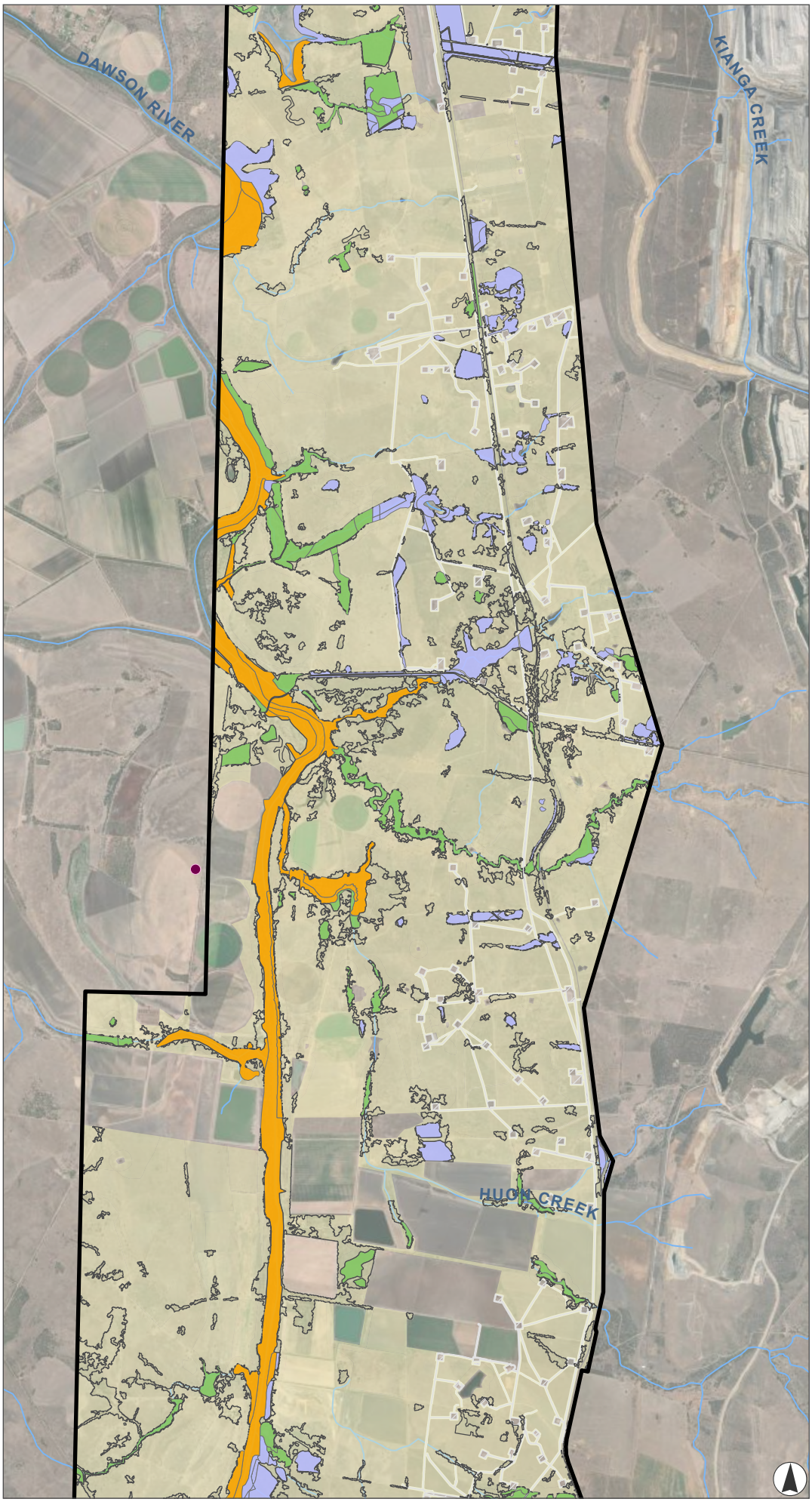


FIGURE 9.13B

Koala *(Phascolarctos cinereus)* Dispersal Habitat with SLATS Woody Areas

Legend

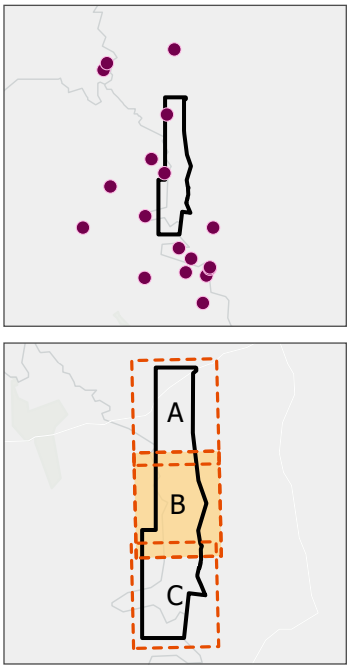
- ALA Records of Koala
- Watercourse
- Project Area
- Existing Westside infrastructure

SLATS 2022

- Woody vegetation (>10% cover) in koala dispersal

Koala Habitat

- Breeding and foraging
- Climate refugia
- Shelter
- Dispersal



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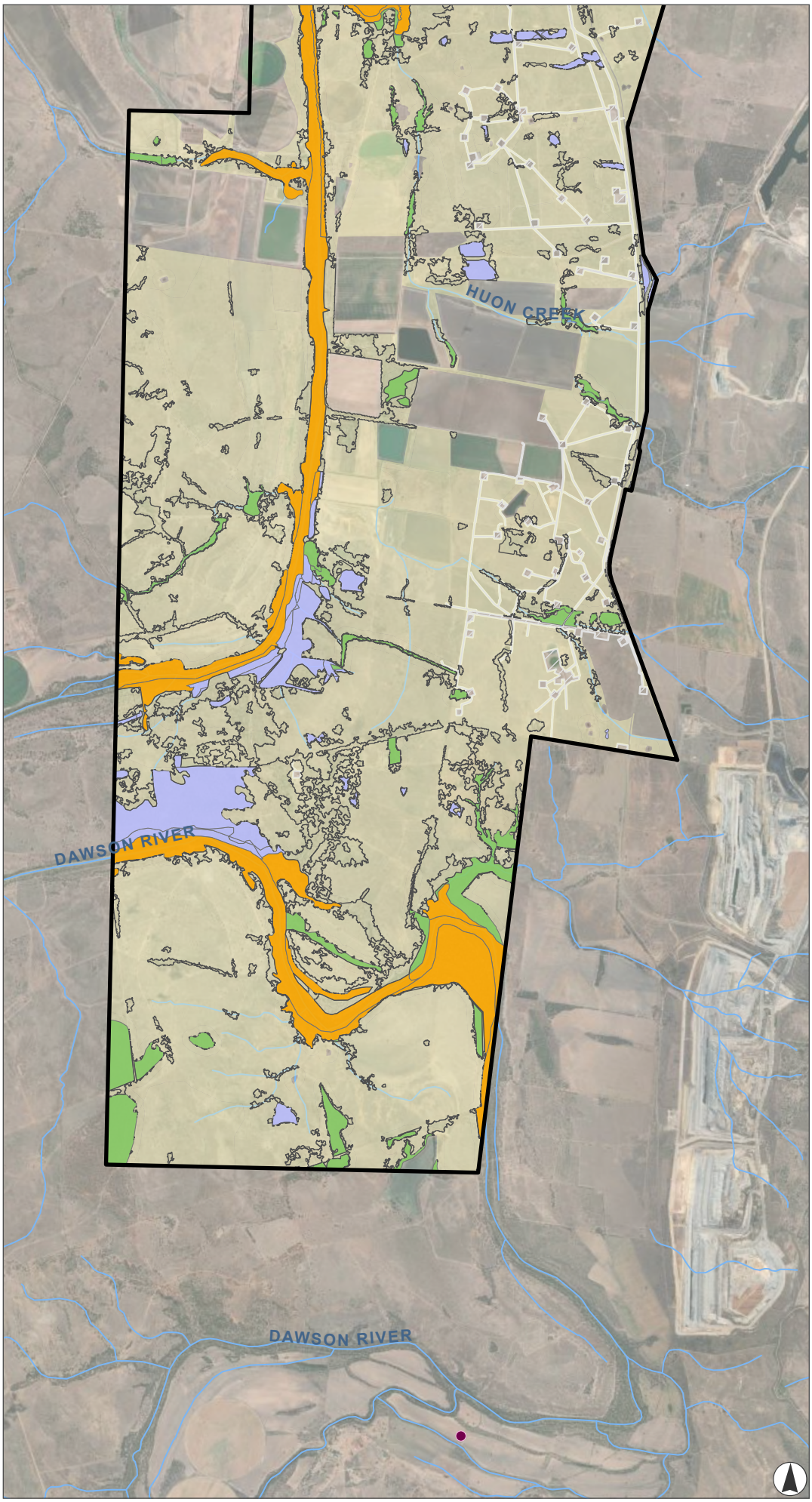


FIGURE 9.13C

Koala *(Phascolarctos cinereus)* Dispersal Habitat with SLATS Woody Areas

Legend

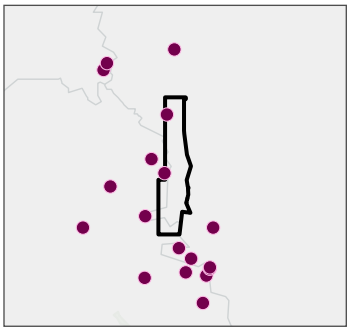
- ALA Records of Koala
- Watercourse
- Project Area
- Existing Westside infrastructure

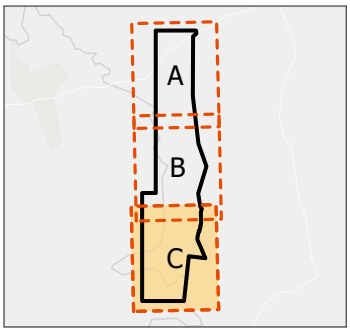
SLATS 2022

- Woody vegetation (>10% cover) in koala dispersal

Koala Habitat

- Breeding and foraging
- Climate refugia
- Shelter
- Dispersal





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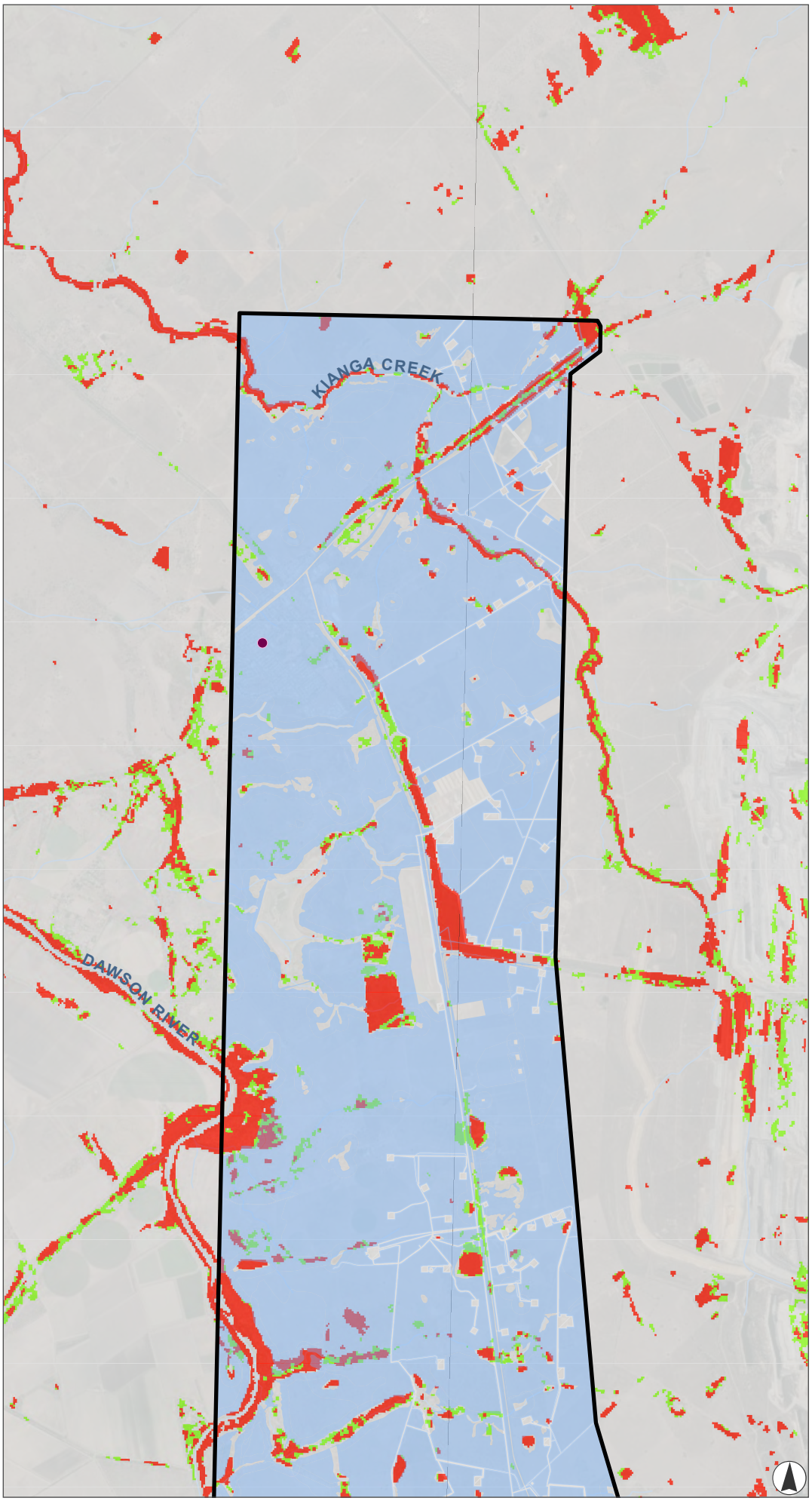


FIGURE 9.14A

Koala *(Phascolarctos cinereus)* Dispersal Habitat with DCCEEW 2021 National Forest and Sparse Woody Vegetation Data

Legend

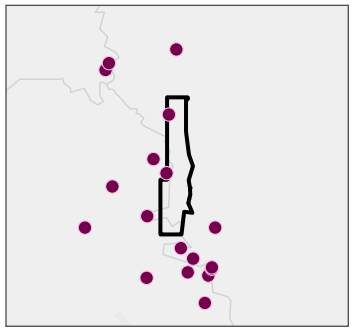
- ALA Records of Koala
- Watercourse
- Project Area
- Existing Westside infrastructure

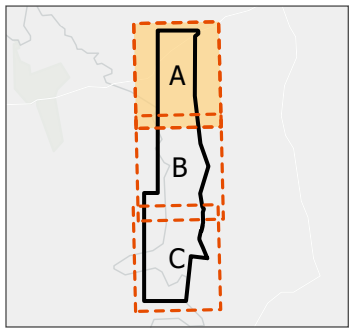
Koala Habitat

- Dispersal

DCCEEW (2021) Woody Vegetation Categories

- Non-woody (<5% cover)
- Sparse woody vegetation (5-19% cover)
- Woody vegetation (>20% cover)





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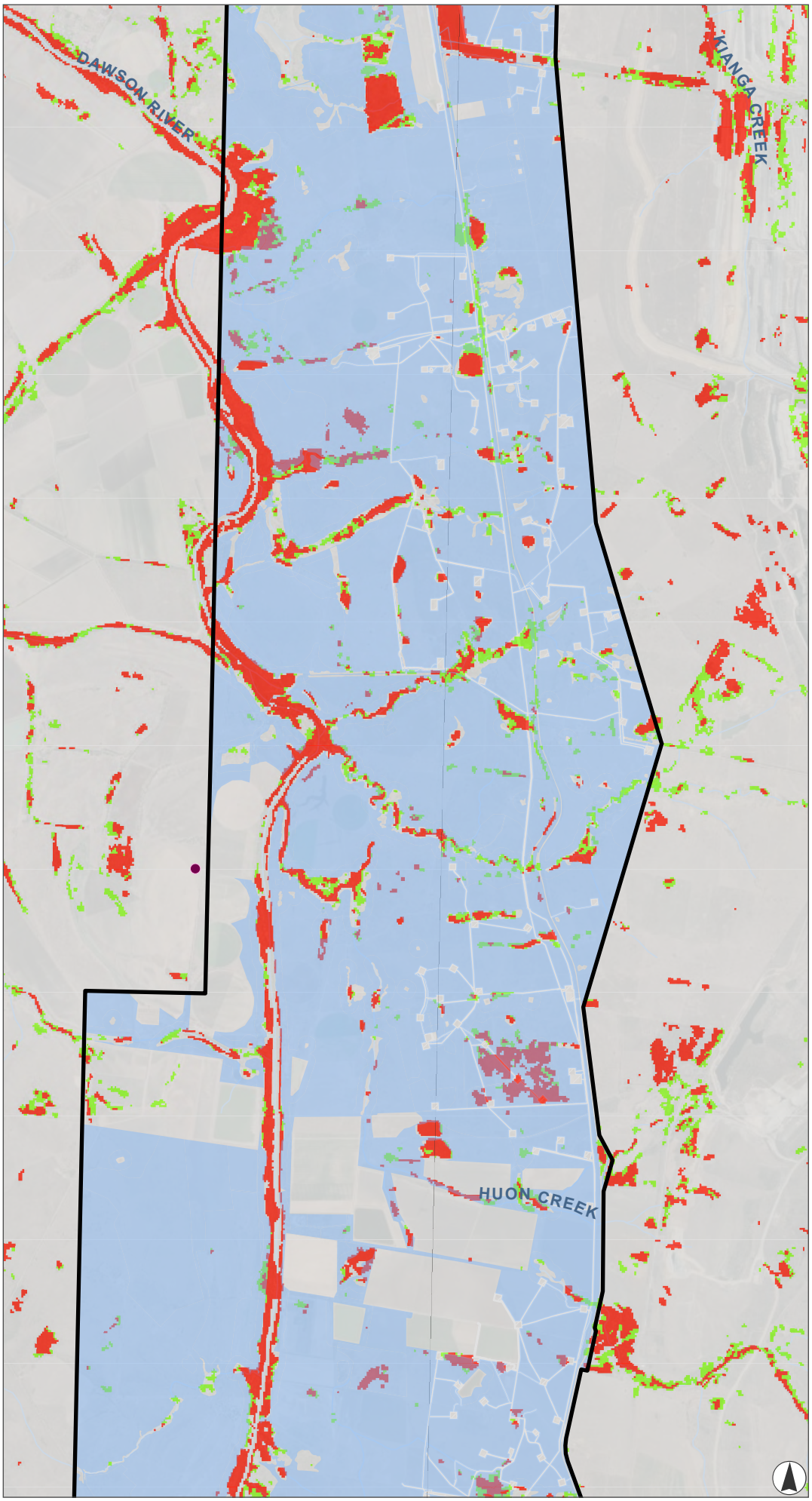

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FIGURE 9.14B

Koala *(Phascolarctos cinereus)* Dispersal Habitat with DCCEEW 2021 National Forest and Sparse Woody Vegetation Data

Legend

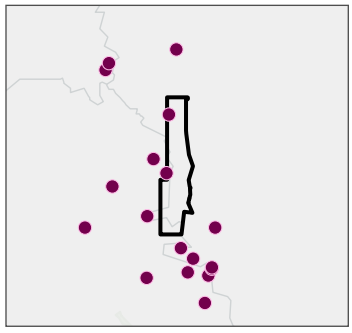
- ALA Records of Koala
- Watercourse
- Project Area
- Existing Westside infrastructure

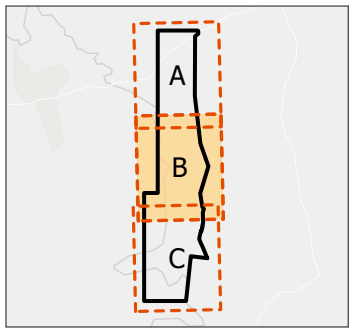
Koala Habitat

- Dispersal

DCCEEW (2021) Woody Vegetation Categories

- Non-woody (<5% cover)
- Sparse woody vegetation (5-19% cover)
- Woody vegetation (>20% cover)





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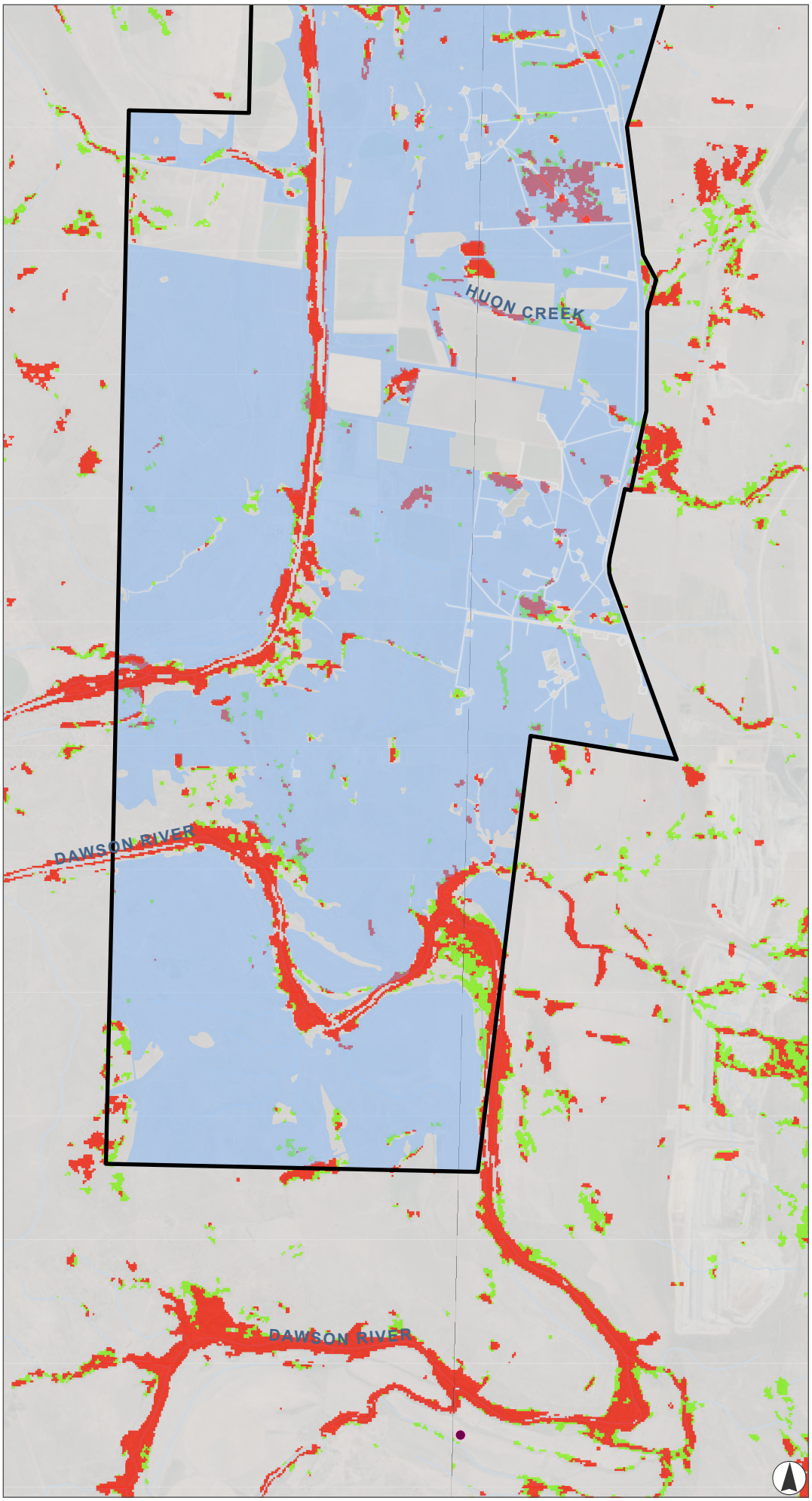


FIGURE 9.14C

Koala *(Phascolarctos cinereus)* Dispersal Habitat with DCCEEW 2021 National Forest and Sparse Woody Vegetation Data

Legend

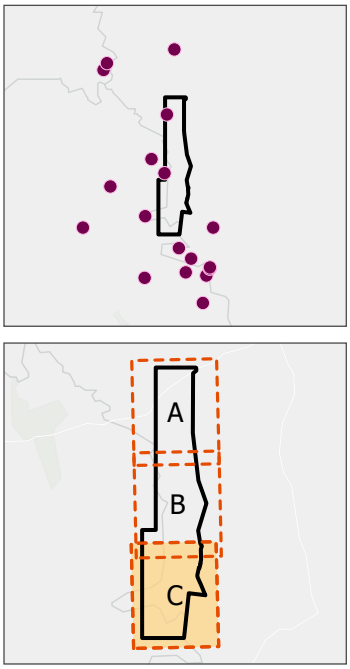
- ALA Records of Koala
- Watercourse
- Project Area
- Existing Westside infrastructure

Koala Habitat

- Dispersal

DCCEEW (2021) Woody Vegetation Categories

- Non-woody (<5% cover)
- Sparse woody vegetation (5-19% cover)
- Woody vegetation (>20% cover)



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9.12 White-throated needletail (*Hirundapus caudacutus*)

9.12.1 Status under the EPBC Act

The white-throated needletail is listed Vulnerable and Migratory under the EPBC Act.

9.12.2 Distribution and Habitat Requirements

The white-throated needletail is a large species of swift which is a non-breeding migrant to Australia typically arriving in September and October. They most commonly migrate to Australia via the Torres Strait and disperse in a southerly direction along the eastern and western sides of the Great Divide in QLD and NSW. By November the species reaches the southern extent of its range in Australia dispersing throughout parts of Victoria, south-eastern South Australia and Tasmania (Higgins, 1999). In the Northern Territory and Western Australia, they occur as vagrants. Estimates place the white-throated needletail's range in Australia at 126,200 km^2 (Higgins, 1999).

White-throated needletails are an almost exclusively aerial, large-bodied swift that are insectivorous feeding on a variety of insect prey items during their migration in Australia across a range of habitat types and landscapes. Whilst in Australia the species is gregarious observed flying in flocks of hundreds and even thousands of birds. They are occasionally observed individually or in smaller groups and can sometimes be found in mixed flocks with other insectivorous aerial species such as fork-tailed swift (*Apus pacificus*) and fairy martins (*Hirundo ariel*). Australia-wide trends in mean number of white-throated needletails counted per flock have fallen from 164 (± 37.3) in 1951–1960 to 42 (± 1.7) in 2001–2010 (Tarburton, 2014), and 36 (± 0.9) in 2011–2017 (Threatened Species Scientific Committee, 2019).

They are regularly recorded above wooded areas including open forest and rainforest, though may also fly below the canopy between trees or in clearings. When flying above farmland, they are more often recorded above partly cleared pasture, plantations, or remnant vegetation at the edge of paddocks. According to the *Draft referral guideline for 14 birds listed as migratory species under the EPBC Act* (Department of the Environment, 2015) trees with dense canopy foliage and tree hollows are considered to provide roosting habitat for white-throated needletail, although the degree to which the species roosts in trees in potentially over-emphasised (Higgins, 1999). Home ranges and territories are not maintained while the birds are in Australia.

9.12.3 Threats

It is thought that the greatest risk to the species globally is the logging of Taiga forests in Siberia (where most of the population breeds) (Threatened Species Scientific Committee, 2019). However, threats within Australia include the loss of roosting sites, collisions with wind turbines, overhead wires, windows, and lighthouses, although the scale of impact to the species at a population level needs more research (Threatened Species Scientific Committee, 2019). The use of pesticides (particularly organochlorines) either through a reduction in the abundance of invertebrates or through secondary poisoning through bioaccumulation may also be threatening this species, but further research is required (Threatened Species Scientific Committee, 2019). Habitat loss is also impacting this species with the loss of forest and woodland habitats leading to the decline of roosting sites and reduction in invertebrate prey, globally.

9.12.4 Occurrence and Potential Habitat

The white-throated needletail was not recorded during the field survey program. It is considered to have a moderate likelihood of occurring within the Project Area and is presumed present, for at least part of the period in which it occurs within Australia. The Project Area occurs within the species 'may occur' distribution extent as per SPRAT.

This species has broad habitat requirements given its aerial nature and only occurs in Australia during its non-breeding season. As such, the entire Project Area may provide suitable habitat. Three ALA records of the species occur within the desktop search extent (one undated, one from 2014 and one from 2009); two of which are located to the west of the Project Area along the Dawson River (the undated and 2014 record), with the 2009 record occurring in proximity to the locality of Banana. According to eBird, the species may utilise the Project Area occasionally during its pre- and post-breeding migration to and from Australia (eBird Australia, 2025).

The entire Project Area (21,002.1 ha) is mapped as potential habitat suitable for foraging and dispersal, including remnant, regrowth and non-remnant vegetation as well as developed areas.

The extent of white-throated needletail habitat within the Project Area is provided below in **Table 9.24**, and the mapped habitat for the species is shown on **Figure 9.15**.

Table 9.24 Habitat Extent for White-throated Needletail

Habitat Utilisation	Habitat Definition	Extent within the Project Area (ha)
Foraging and dispersal	Includes a range of habitats, although more often over wooded areas, where it is almost exclusively aerial.	21,002.1
	Total	**21,002.1**

9.12.5 Important Populations

The SPRAT database does not identify 'important populations' of the white-throated needletail. However, it does state that while in Australia, all individual white-throated needletails are expected to comprise a single, continuous population. The total population for the species is estimated to be approximately 41,000 birds (Garnett, Baker and Barry, 2022).

9.12.6 Habitat Critical to the Survival of the Species

Habitat critical to the survival of the species is not specifically defined for the species. However, the *Significant Impact Guidelines 1.1 – MNES* (Department of the Environment, 2013b) define habitat critical to the survival of a species or ecological community as areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal.
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators).
- To maintain genetic diversity and long-term evolutionary development.
- For the reintroduction of populations or recovery of the species or ecological community.

The species is a non-breeding migrant to Australia and is mostly aerial, foraging on the wing and moving with weather systems. Foraging habitat requirements are therefore very broad. The species may roost in tall, hollow bearing trees at the top of ridges, on vertical tree trunks, rock faces and dense canopy foliage (Department of the Environment, 2015).

Relative to foraging and dispersal habitat, roosting habitat is likely to be more restrictive. As roosting habitat is considered absent from the Project Area, no areas of modelled habitat are considered critical to the survival of the species.

9.12.7 Potential Project Impacts and Key Mitigation Measures

Due to the species ecology, no clearing limit has been identified for this species. However, as no roosting habitat is mapped within the Project Area, no direct impacts are expected on the species since the white-throated needletail is predominantly aerial except when roosting.

Potential indirect impacts on white-throated needletail habitat (fly-over foraging habitat) as a result of the Project include:

- Habitat fragmentation and edge effects.
- Weeds and pests.

General mitigation measures are outlined in **Section 8.2.1** and are all considered likely to further mitigate potential impacts on the species. Given the nature of the species (predominantly aerial) and the Project (predominantly discrete infrastructure up to 2 m above ground or subsurface), no mitigation measures specific to white-throated needletail are proposed or considered necessary.

9.12.8 Significant Impact Assessment

The significant impact assessment for this species is presented in **Table 9.25** below. In summary, the assessment found that the Project is **unlikely to result in a significant impact on the white-throated needletail.**

Table 9.25 Significant Impact Assessment – White-throated Needletail

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Lead to a long-term decrease in the size of an important population of a species	A long-term decrease in the size of a white-throated needletail population is unlikely given Project activities will be collocated with existing disturbance. Direct impacts will occur to foraging and dispersal habitat only (fly-over foraging). Indirect impacts on the species as a result of the Project are expected to be limited. The Project is highly unlikely to increase or introduce pests as many are known to occur already and existing conduits for movement are present.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Reduce the area of occupancy of an important population	Project activities will be collocated with existing disturbance, and direct impacts will occur to foraging and dispersal habitat only (fly-over foraging). Therefore, it is unlikely that the Project will result in a reduction of the area of occupancy of an important population.	Unlikely
Fragment an existing important population into two or more populations	It is unlikely that the Project will result in the fragmentation of an existing important population; Project activities will be collocated with existing disturbance and direct impacts will occur to foraging and dispersal habitat only (fly-over foraging).	Unlikely
Adversely affect habitat critical to the survival of a species	As roosting habitat is considered absent from the Project Area, no areas of modelled habitat are considered critical to the survival of the species.	Unlikely
Disrupt the breeding cycle of an important population	This species is a non-breeding migrant to Australia. As the species forages predominantly on insects, foraging resources are widely available and are not a limitation to building sufficient energy reserves required for their return migration to breeding grounds.	Unlikely
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The species is mostly aerial and individuals are only likely to utilise the Project Area temporarily while on migration south or north. The species is known to utilise fragmented landscapes and will occur over cleared areas. The Project will not lead to the further degradation of retained habitat, as potential indirect impacts such as edge effects, and weeds and pests will be actively managed via Project management plans. The Project will not increase the use of pesticides which may reduce the availability of prey.	Unlikely
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Invasive species are not known to be a threat to the white-throated needletail. Nonetheless, the Project will employ best practice control methods for weeds and pests and with the successful implementation of the proposed mitigation measures it is unlikely to introduce or exacerbate weeds or pests beyond existing levels.	Unlikely
Introduce disease that may cause the species to decline	There are no known diseases affecting the species. The Project will employ appropriate biosecurity protocols during construction and operation; therefore, introduction of a disease that may cause the species to decline is unlikely.	Unlikely
Interfere substantially with the recovery of the species	As identified in the SPRAT, a Recovery Plan for the white-throated needletail is not required as the necessary information is provided in the species' Conservation Advice (Threatened Species Scientific Committee, 2019). This document identifies the primary conservation actions for the species as the protection of breeding habitat in East Asia.	Unlikely

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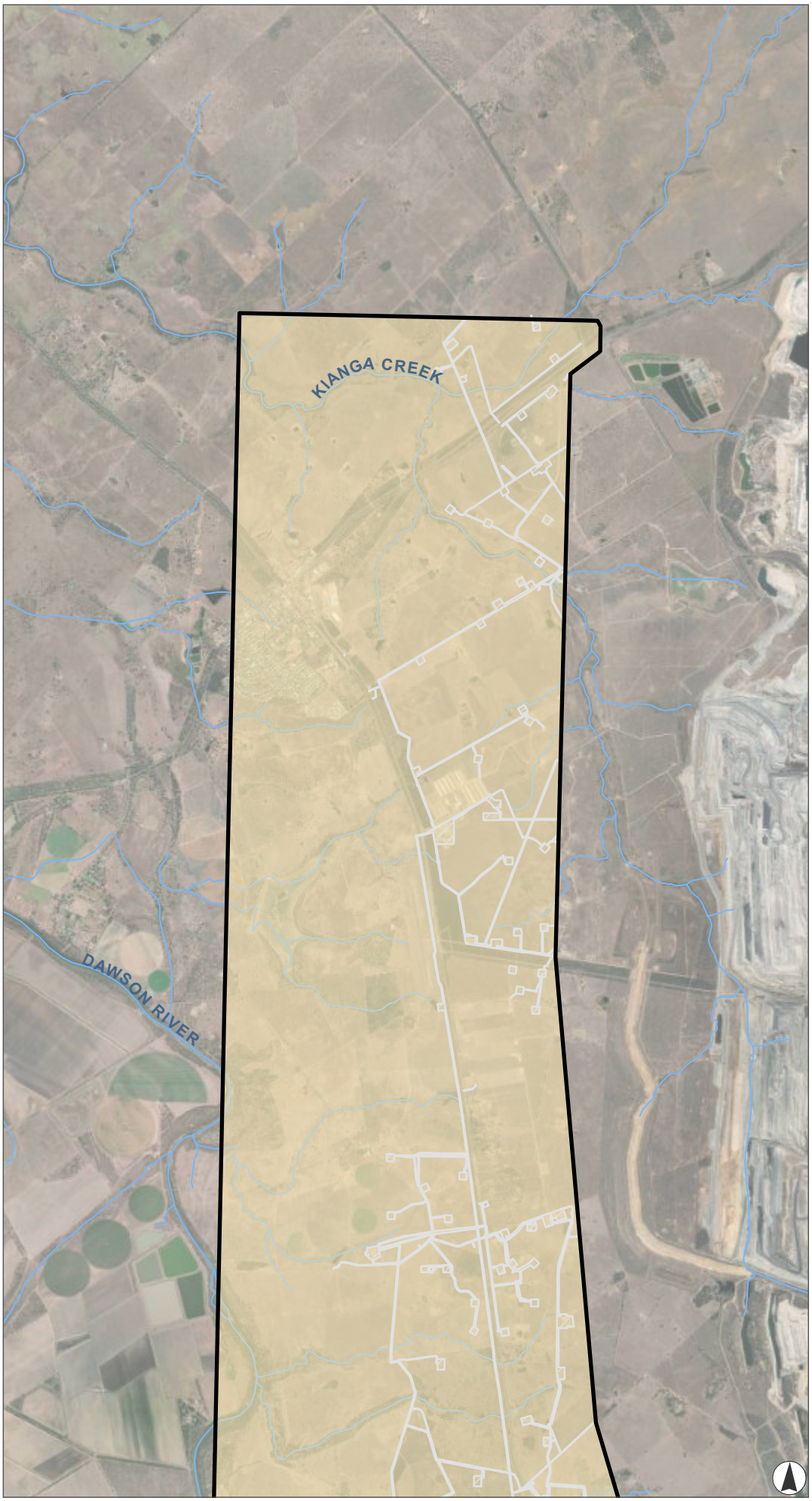


FIGURE 9.15A

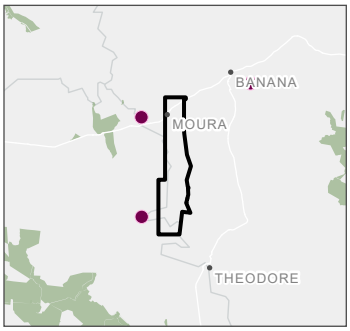
White-throated needletail *(Hirundapus caudacutus)* Habitat and Records

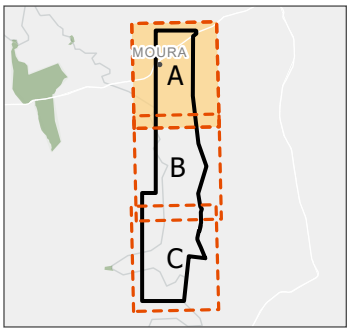
Legend

- ALA Records of White-throated Needletail
- Watercourse
- Project Area
- Existing Westside infrastructure

White-throated Needletail habitat mapping

- Foraging and dispersal





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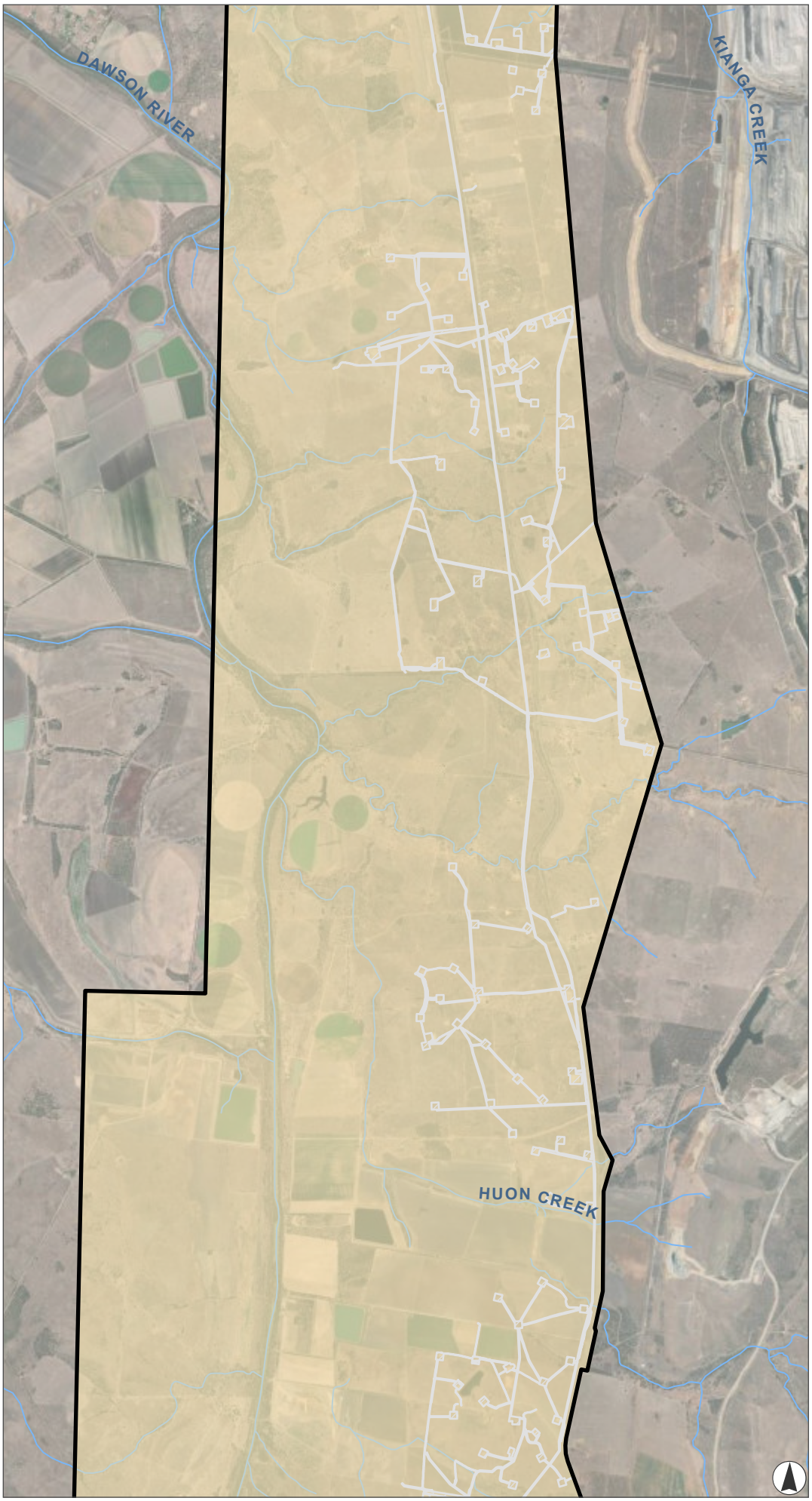


FIGURE 9.15B

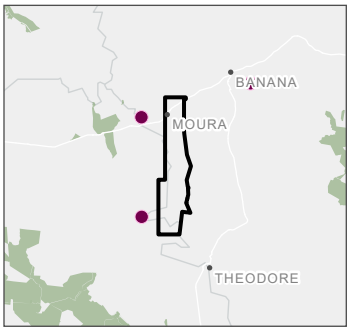
White-throated needletail *(Hirundapus caudacutus)* Habitat and Records

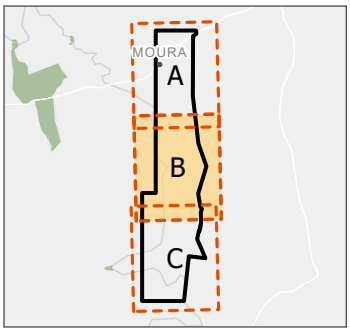
Legend

- ALA Records of White-throated Needletail
- Watercourse
- Project Area
- Existing Westside infrastructure

White-throated Needletail habitat mapping

- Foraging and dispersal





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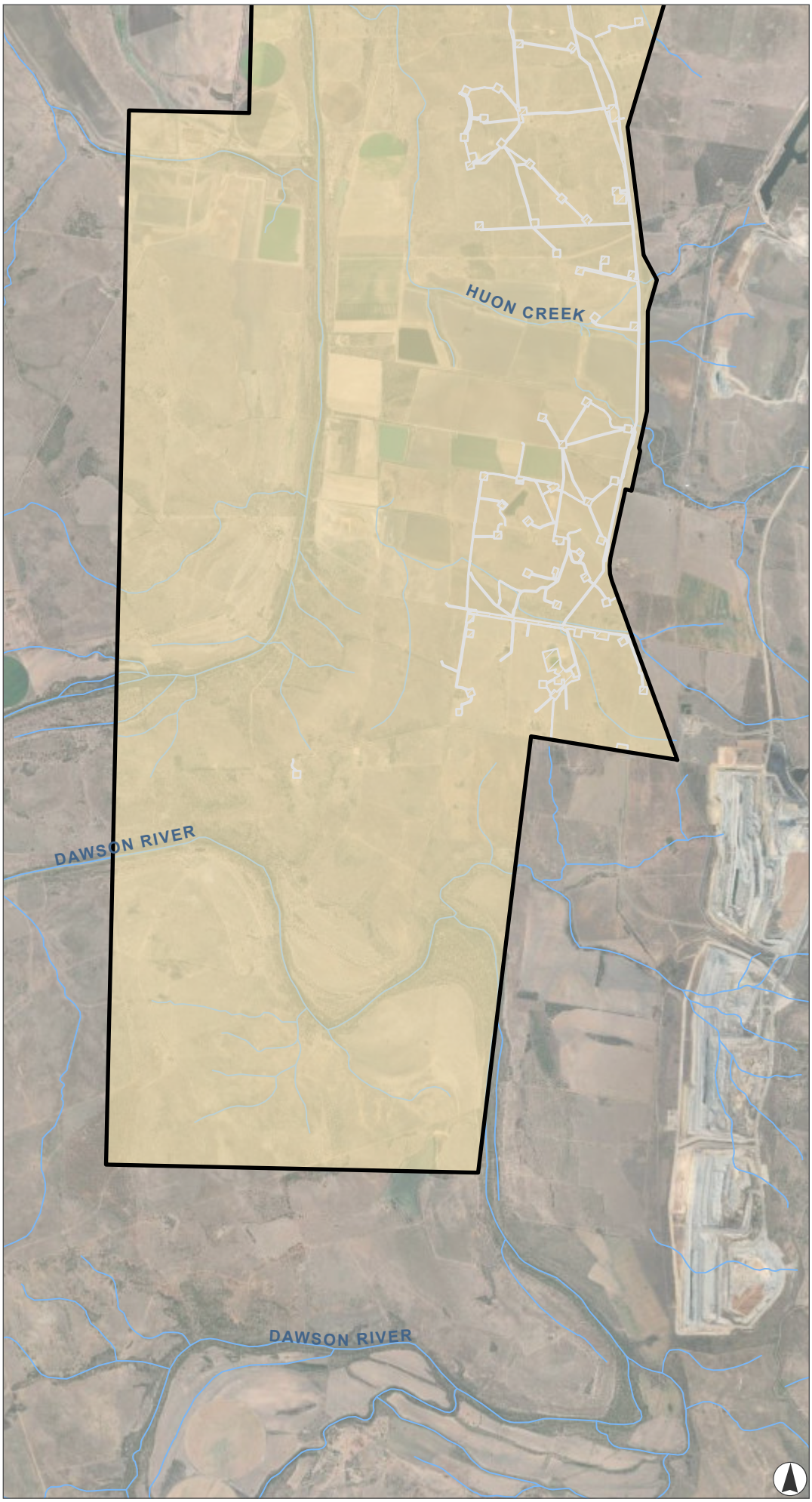


FIGURE 9.15C

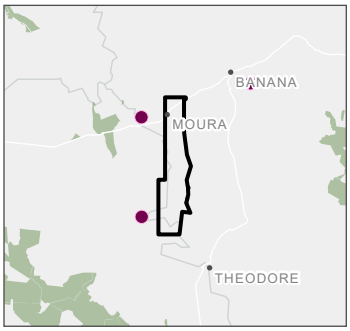
White-throated needletail *(Hirundapus caudacutus)* Habitat and Records

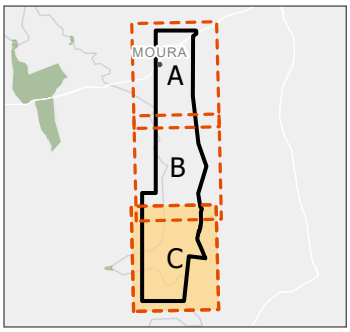
Legend

- ALA Records of White-throated Needletail
- Watercourse
- Project Area
- Existing Westside infrastructure

White-throated Needletail habitat mapping

- Foraging and dispersal





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9.13 Yakka skink (*Egernia rugosa*)

9.13.1 Status under the EPBC Act

The yakka skink is listed as Vulnerable under the EPBC Act.

9.13.2 Distribution and Habitat Requirements

The yakka skink has a broad distribution which extends from the coast to the hinterland of sub-humid to semi-arid eastern QLD. This vast area covers portions of the Brigalow Belt, Mulga Lands, South-east QLD, Einasleigh Uplands, Wet Tropics and Cape York Peninsula Biogeographical Regions (Department of the Environment, 2014). The Mulga Lands and Brigalow Belt South Bioregions are reported to comprise the core habitat of this species; however, populations throughout the Brigalow Belt are highly fragmented. As per SPRAT, the Project Area is located within a 'may occur' area of the species' predicted distribution, with 'Likely to occur' extents located to the north-east and south.

This species inhabits open dry sclerophyll forest or woodland, scrub and less frequently, cleared areas (Department of the Environment, 2014) where suitable microhabitat is supported. As defined on the species' SPRAT profile, it occurs in a range of RE types on land zones 3, 4, 5, 7, 9 and 10 and occasionally on basalt plains and hills (land zone 8) although this is not representative of core habitat. Land zone 12 communities are only considered suitable in the Wet Tropics bioregion (Department of Climate Change, Energy, the Environment and Water, 2023a). This species is not generally found in rocky habitats (Chapple, 2003).

As described in the *Targeted species survey guidelines – yakka skink* (Ferguson and Mathieson, 2014), core habitat throughout the Brigalow Belt and Mulga Lands, where the highest numbers of yakka skink have been detected so far include the following broad vegetation types:

- Poplar box (*Eucalyptus populnea*) woodland.
- Mulga (*Acacia aneura*) woodland.
- White cypress pine (*Callitris glaucophylla*); usually in association with eucalypt species such as *E. populnea*, *E. melanophloia* or *Corymbia tessellaris.*
- Ironbark (typically *E. melanophloia*) woodland.
- Disturbed, treated and cleared areas of suitable habitat, grazed or ungrazed, where suitable microhabitat features (see below) still remain.

Within the Brigalow Belt and Mulga Lands, yakka skink has been recorded far less frequently from:

- Brigalow (*Acacia harpophylla*); usually where soils are conducive to tunnel erosion.
- Bendee (*Acacia catenulata*).
- Belah (*Casuarina cristata*).
- Lancewood (*Acacia shirleyi*).
- Buloke (*Allocasuarina luehmannii*).

The yakka skink typically occupy self-excavated burrows and cavities under microhabitat such as large fallen timber, rock crevices, tree stumps and grass tussocks (Department of the Environment, 2014). They are also known to utilise tunnel erosion, root cavities and disused rabbit warrens, particularly in cleared areas. The species exhibits complex sociality and within these burrows, they live in colonies or aggregations of up to 21 individuals ranging in size and age. Ehmann (1992) and Wilson and Knowles (1987) report that the yakka skink, like several related species, has communal defecation sites near permanent burrows. They are extremely secretive and seldom venture far from shelter sites, where they retreat to at the first sign of disturbance (Department of the Environment, 2014). Searching for burrow systems and communal defecation sites is the most reliable method of detection (Department of Sustainability, Environment, Water, 2011).

Given the yakka skink's longevity (up to 20 years), low fecundity (2–5 years to sexual maturity), high site-fidelity, and that populations are highly fragmented, this species may be prone to localised extinctions (Department of Climate Change, Energy, the Environment and Water, 2023a).

9.13.3 Threats

The primary threat to the species is habitat reduction and degradation, which is prevalent within their core range primarily associated with agricultural and urban development. Other threats to the yakka skink include inappropriate roadside management, including road widening and removal of wood debris and rock microhabitat features. Predation by feral animals such as red fox (*Vulpes vulpes**) and feral cat (*Felis catus**) as well as ripping of rabbit warrens are also known impacts the species.

9.13.4 Occurrence and Potential Habitat

The yakka skink was not recorded during the field survey program. No potential burrow sites or latrines were detected either, despite the approximately 68.5 person hours of active diurnal searches between 2019 and 2024. Potentially suitable woodland habitat occurs within the Project Area. However, habitat surveyed to date is marginally suitable due to the hard clay-based soils (unsuitable for burrows) and lacking refuge microhabitat.

The Project Area occurs primarily within the species 'may occur' distribution extent. The far north-eastern extent of the Project Area occurs within the species 'likely to occur' extent. The species was not detected during surveys for any of the other identified projects in the region that have been referred in the last decade, including the Banana Range Wind Farm, which occurs closer to the nearby 'likely to occur' extent of the species distribution (see **Section 6.2.2**).

One ALA record from 1975 occurs within the desktop search extent, located to the northeast of the Project Area near the locality of Banana. The record is associated with OZCAM and the associated location has been generalised by 2 km. However, as the GPS location provided is not precise (-24.5, 150.1) and therefore it is considered possible that the spatial uncertainty is greater. The next nearest record (dated 1955) is located approximately 47 km to the north-east. The species is conservatively considered to have a moderate likelihood of occurrence within the Project Area, noting it is secretive and rare, and detailed field surveys have not yet been completed across all areas that may be impacted by the Project.

A total of 2,205.9 ha of habitat potentially suitable for breeding and foraging is mapped within the Project Area, including forests and woodlands analogous to REs 11.3.1, 11.3.17, 11.3.2, 11.3.3, 11.3.4, 11.3.6, 11.4.12, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.9a, 11.5.2, 11.5.2a, 11.9.1, 11.9.10, 11.9.2, 11.9.5 and 11.9.7.

Ground layer microhabitat was assessed at habitat assessment sites throughout the field survey program. Large logs which the species is thought to prefer were often rare as were burrowing opportunities, particularly in areas of land zone 9. No areas were found to contain large rocks, rabbit warrens or rock piles. Given the current mapping of potential yakka skink habitat within the Project Area has not excluded any areas based on microhabitat, it is considered highly likely it overstates the true availability of habitat. Furthermore, cattle grazing activities are ongoing throughout the Project Area and are likely to continue to reduce the availability of microhabitat.

The extent of yakka skink habitat within the Project Area is provided below in **Table 9.26**, and the mapped habitat for the species is shown on **Figure 9.16**.

Table 9.26 Habitat Extent for Yakka Skink

Habitat Utilisation	Habitat Definition	Extent within the Project Area (ha)
Breeding and foraging	Dry sclerophyll forests, woodlands and scrub that support suitable refuge microhabitat including but not limited to, large hollow logs, cavities or burrows under large fallen trees, tree stumps, logs, stick-raked piles, large rocks and rock piles, dense ground-covering vegetation, and deeply eroded gullies, rabbit warrens, tunnels and sinkholes.	2,205.9
Not habitat[1]	Any patch of potential breeding and foraging habitat that has been subject to field assessment (effort appropriate to site size and inclusive of targeted yakka skink search transects / diurnal searches) and determined to not contain any potential burrows or latrine sites.	0.0
	Total	**2,205.9**

[1] This definition has been included for the sole the purpose of future field scout assessments and has not been applied to the mapping presented in this report.

9.13.5 Important Populations

As per the *Draft referral guidelines for the nationally listed Brigalow Belt reptiles* (Department of Climate Change, Energy, the Environment and Water, 2023a), the occurrence of known 'important habitat' is a surrogate for an 'important population' of this species.

'Suitable habitat' for the species has been defined in the Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles as:

- 'Open-forests to low-woodlands and scrub in QLD RE land zones 3, 4, 5, 7, 8, 9, 10 and 12 (land zone 8 not considered core habitat; land zone 12 in Wet Tropics bioregion only). Colonies have been found in large hollow logs, cavities or burrows under large fallen trees, tree stumps, logs, stick-raked piles, large rocks and rock piles, dense ground-covering vegetation, and deeply eroded gullies, tunnels and sinkholes.'

Known 'important habitat' for the yakka skink is defined as:

- Any contiguous patch of suitable habitat, particularly remnant vegetation, where a colony is known or identified.
- Any microhabitat where colonies are likely to be found.

Suitable habitat for the yakka skink can also be considered as 'important' if it is:

- Habitat where the species has been identified during a survey.
- Near the limit of the species' known range.
- Large patches of contiguous, suitable habitat and viable landscape corridors (necessary for the purposes of breeding, dispersal or maintaining the genetic diversity of the species over successive generations). OR
- A habitat type where the species is identified during a survey, but which was previously thought not to support the species.

It is important to note that not all areas of mapped habitat have been surveyed, and therefore the presence of suitable micro-habitat to support the species is not fully known. Therefore, a conservative approach has been taken and it is assumed that all mapped habitat within the Project Area meets the definition of 'important habitat.'

9.13.6 Habitat Critical to the Survival of the Species

There are no species-specific guidelines for determining habitat critical to the survival of the yakka skink, and at present no recovery plan exists. As important habitat has been defined in the *Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles* (Department of Climate Change, Energy, the Environment and Water, 2023a) as stated above, this terminology is considered to be interchangeable with 'habitat critical to the survival of the species' in regards to this species. As such 'habitat critical to the survival of the species' is present in communities with macrohabitat and microhabitat features suitable to support a colony.

9.13.7 Potential Project Impacts and Key Mitigation Measures

Westside have committed to no direct impacts to yakka skink habitat. This currently includes all areas mapped on **Figure 9.16**, subject to detailed field scouts.

Potential indirect impacts on yakka skink as a result of the Project include:

- Habitat fragmentation and edge effects.
- Weeds and pests.
- Noise and light disturbance.

General mitigation measures are outlined in **Section 8.2.1**. Mitigation measures specific to yakka skink are outlined in **Section 8.2.2** and below:

- Threatened fauna individuals and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of threatened fauna habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped).

- All areas of potential habitat will be designated a high constraint area and no direct impacts as a result of the Project will be permitted.
- In the unlikely event that a yakka skink is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days.
- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.
- Measures outlined in the Westside Noise Management Plan (WCL-0000-HS-PLN-009), Erosion and Sediment Control Procedure (WCL-0000-HS-PRC-029) and Weed Management Procedure (WCL-0000-HS-PRC-034) will be implemented to minimise indirect impacts to the species.

9.13.8 Significant Impact Assessment

The significant impact assessment for this species is presented in **Table 9.27** below. In summary, the assessment found that the Project is **unlikely to result in a significant impact on the yakka skink**.

Table 9.27 Significant Impact Assessment – Yakka Skink

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Lead to a long-term decrease in the size of an important population of a species	The yakka skink, nor any signs of yakka skink such as potential latrines or burrows, have been recorded during the field survey program. It is considered possible that the species has become locally extinct, given the extensive agricultural development that has occurred and the detrimental biological characteristics of the species including high site fidelity and low fecundity. However, to ensure a conservative approach to future assessments that ensure the species is surveyed for and considered, the species has been determined to have a moderate likelihood of occurrence. Potentially suitable woodland habitat occurs within the Project Area. However, habitat surveyed to date is marginally suitable due to the hard clay-based soils (unsuitable for burrows) and lacking refuge microhabitat. A long-term decrease in the size of a yakka skink population is unlikely given Project activities will be collocated with existing disturbance and suitable breeding and foraging habitat will be avoided during the design of the Project. Indirect impacts on the species as a result of the Project are expected to be limited. The Project is highly unlikely to increase or introduce pests as many are known to occur already and existing conduits for movement are present. Nonetheless, potential indirect impacts on the species' and its habitat will be actively managed via Project management plans.	Unlikely
Reduce the area of occupancy of an important population	The yakka skink has a relatively large distribution. While any population that may occur within the Project Area would constitute an important population, to date no evidence of presence has been recorded. Further, the Project Area does not occur near any known populations nor the limit of the species range. Project activities will be collocated with existing disturbance, and all areas of breeding and foraging habitat will be avoided (maximum disturbance limit of 0.0 ha). Therefore it is unlikely that the Project will result in a reduction of the area of occupancy of an important population.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Fragment an existing important population into two or more populations	Suitable habitat supported by the Project Area generally exhibits very low levels of connectivity. It is unlikely that the Project will result in the fragmentation of an existing important population; Project activities will be collocated with existing disturbance. Breeding and foraging habitat will be avoided by Project (maximum disturbance limit of 0.0 ha).	Unlikely
Adversely affect habitat critical to the survival of a species	There is no Recovery Plan for this species and as such no habitat critical to the survival of the yakka skink has been defined. However, 'important habitat' has been identified within the Project Area which is considered to be a surrogate for habitat critical to the survival of this species. No direct impacts will be permitted to areas of breeding and foraging habitat.	Unlikely
Disrupt the breeding cycle of an important population	No specific breeding habitat or breeding season is known for the yakka skink. However, as this species' births live young and they live in colonies in burrows, it is expected that these burrow systems are used as breeding places. No potential burrows (or laterine sites which often occur adjacent to the burrow) have been identified within the Project Area to date. The species exhibits a high site fidelity, so is unlikely to leave any burrow site of its own volition. Therefore, all future field scouts will ensure the species and indirect signs of the species (latrine sites and burrows) are searched for by a qualified ecologist. No direct impacts will be permitted to areas of breeding and foraging habitat, and indirect impacts will be managed via Project management plans.	Unlikely
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	While no direct impacts will occur to breeding and foraging habitat, it is acknowledged that the results of habitat clearance within the Project Area may indirectly impact the species. Future field scouts will ensure that the presence and extent of potential habitat is assessed within a minimum of 30 m of the infrastructure location, to ensure habitat that may be adjacent to impacts is considered. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped). As described above, no potential burrows or latrine sites have been identified to date and it is considered possible that the species is locally extinct. Edge effects are not expected to be amplified significantly and light spill and increased noise are expected to be temporary and localised. The nature and scale of indirect impact is considered to be minimal in the context of available suitable habitat within the Project Area and the staged and discrete nature of the development. Potential impacts will be actively managed via the Project's management plans.	Unlikely
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Predation by red fox and feral cat have been identified as a threat to the yakka skink. The Project Area is already severely fragmented with existing conduits for movement, and therefore it is considered unlikely that clearing required for construction of the Project will significantly exacerbate the movement of exotic predators. The Project will employ best practice control methods for weeds and pests and is unlikely to introduce or exacerbate weeds or pests beyond existing levels.	Unlikely
Introduce disease that may cause the species to decline	Disease has not been listed as a threat to this species. However, weed and pest management for the Project will ensure best practice site hygiene measures.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Interfere substantially with the recovery of the species	The Project will have minimal impact to the primary conservation actions as stipulated in the Conservation Advice, since the species and it's habitat will be considered as part of all future field scouts and there will be no direct impacts to suitable habitat.	Unlikely

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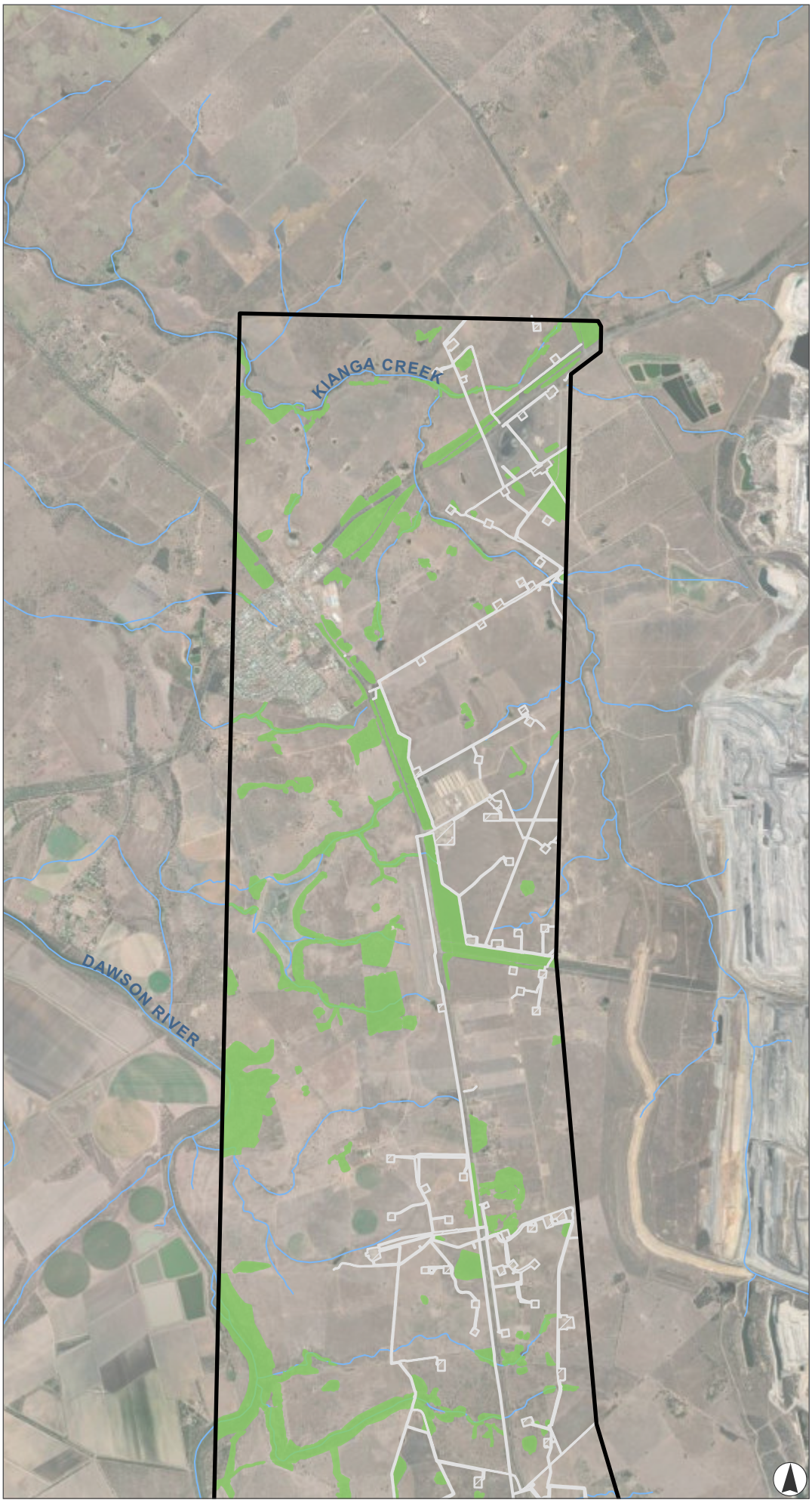
FIGURE 9.16A

Yakka skink *(Egernia rugosa)* Habitat and Records

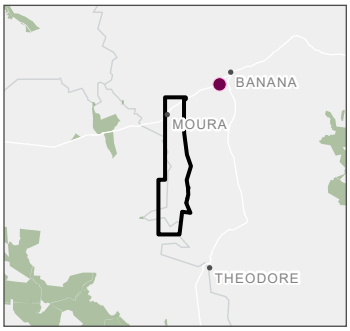


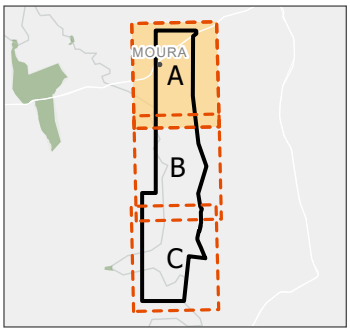
Legend

- ALA Records of Yakka skink
- Watercourse
- Project Area
- Existing Westside infrastructure

Yakka skink habitat mapping

- Breeding and foraging





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Kilometres

Scale 1:80,000 at A4
GDA2020 MGA Zone 55

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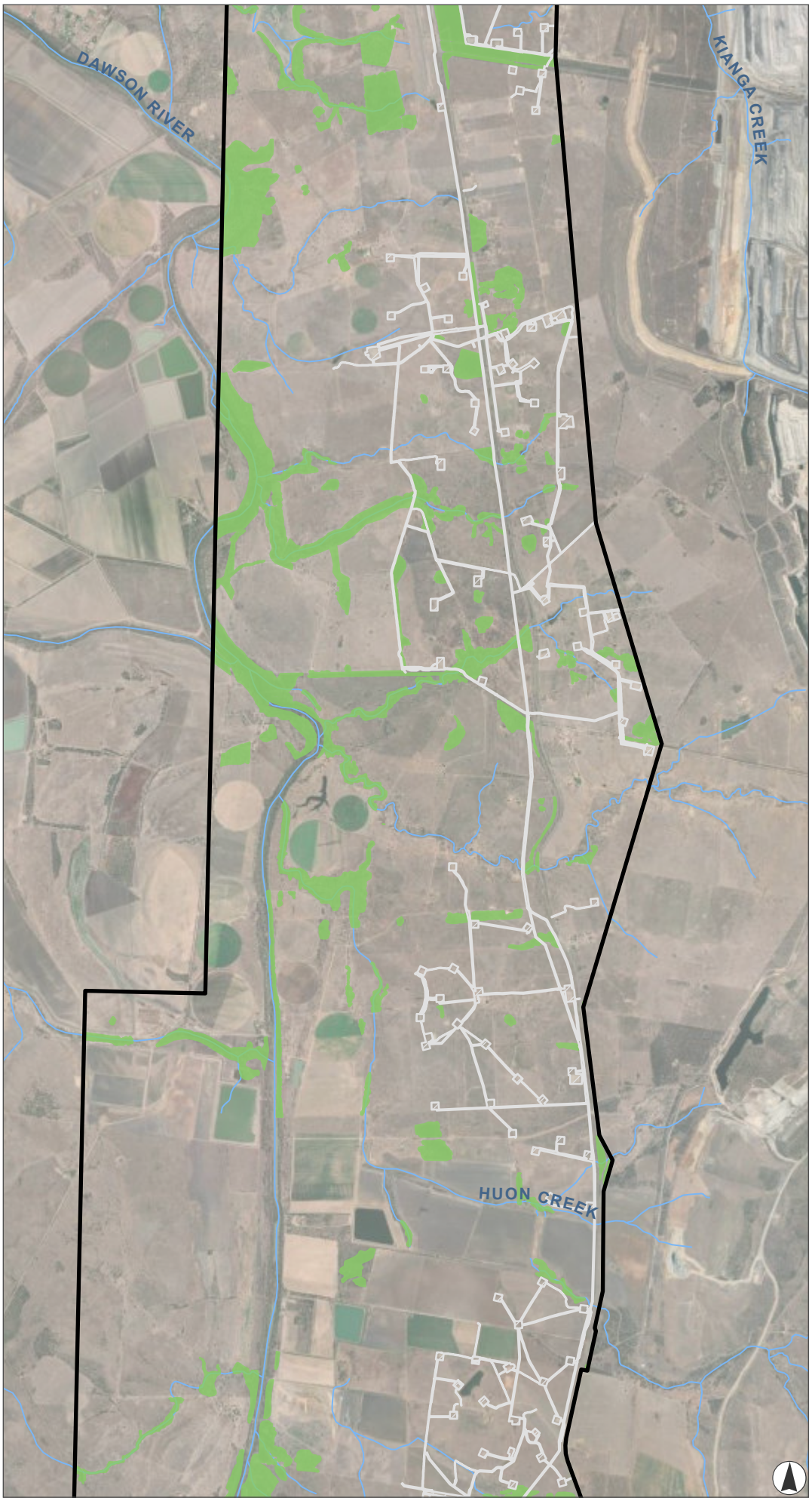


FIGURE 9.16B

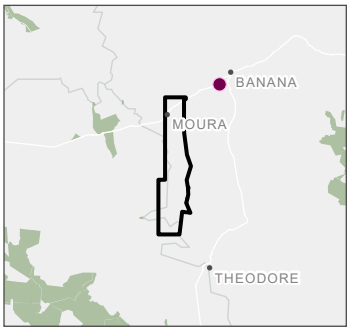
Yakka skink *(Egernia rugosa)* Habitat and Records

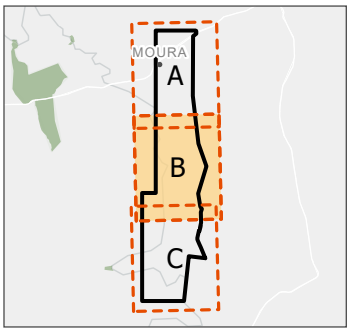
Legend

- ALA Records of Yakka skink
- Watercourse
- Project Area
- Existing Westside infrastructure

Yakka skink habitat mapping

- Breeding and foraging





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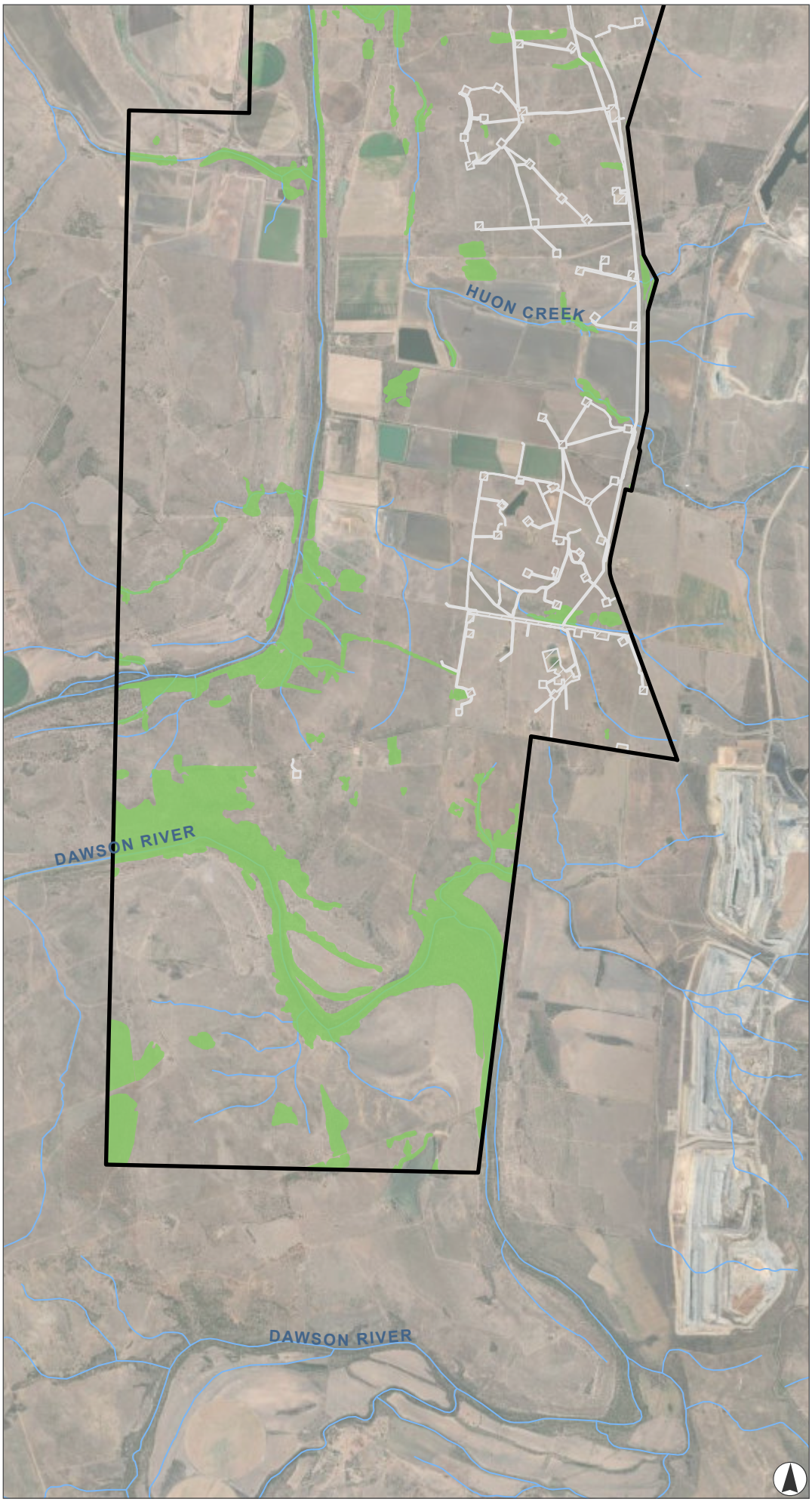


FIGURE 9.16C

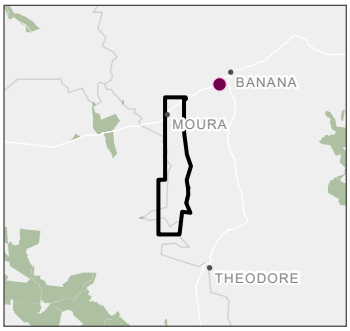
Yakka skink *(Egernia rugosa)* Habitat and Records

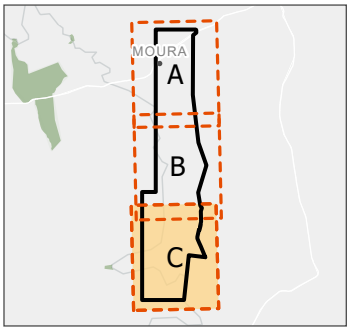
Legend

- ALA Records of Yakka skink
- Watercourse
- Project Area
- Existing Westside infrastructure

Yakka skink habitat mapping

- Breeding and foraging





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9.14 Greater glider (central and southern) (*Petauroides volans*)

9.14.1 Status under the EPBC Act

At the time of the referral decision date (30 June 2022), the greater glider (central and southern) was listed as Vulnerable under the EPBC Act. It is recognised that the species listing was upgraded to Endangered on 5 July 2022, however the Vulnerable species criteria has been used for this assessment.

9.14.2 Distribution and Habitat Requirements

Based on the findings of McGregor *et al.*, 2020), at least two species of greater glider are recognised to occur within QLD: *Petauroides volans* (southern and central) and *Petauroides minor* (northern).
As suggested by the common name, *Petauroides minor* is restricted to a relatively small area of northern QLD from Townsville to the Windsor Tablelands and has a highly disjunct distribution. Relative to the northern species, the southern and central species (*Petauroides volans*) has a broad and mostly continuous distribution from Proserpine in QLD, south through NSW and the ACT, to Wombat State Forest in central Victoria (Department of Climate Change, Energy, the Environment and Water, 2022a).

Greater gliders are typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. During the day, this species spends most of its time denning in hollowed trees, with each animal inhabiting up to twenty different dens within its home range. Hollows are therefore an important and limiting habitat resource. As described in the species' Conservation Advice (Department of Climate Change, Energy, the Environment and Water, 2022a), the species' probability of occurrence is positively correlated with the availability of tree hollows. Tree hollows can be difficult to detect in ground-based surveys. Therefore, the presence of trees with diameter at breast height >30 cm can be used as a proxy measure for tree hollows used by greater gliders in Queensland (Eyre et al. 2021 in Department of Climate Change, Energy, the Environment and Water, 2022a).

Greater gliders are primarily folivorous, with a diet mostly comprising the leaves and flowers of Myrtaceae (e.g. eucalypt) trees. The species favours forests with a diversity of eucalypt species due to seasonal variation in its preferred foraging tree species. They use gliding locomotion to move between trees and are dependent on tree cover for movement through their home ranges. Wakefield (1970) states that the glide angle for this species is approximately 40° based on extensive field observations. The species is known to be very clumsy when moving along the ground and highly vulnerable to terrestrial predators (Fleay 1947), suggesting there is a strong preference to land on a tree trunk. Noting this, the glide angle and other factors (such as the fact that launch points are unlikely to be the very top of the tree), low woodlands (i.e. canopy 10 m or less) do not facilitate movement.

Habitat in QLD

Additional information regarding the suitability of habitat for the species in Queensland is provided in the *Guide to greater glider habitat in QLD* (Eyre, Smith, *et al.*, 2022) (henceforth the Guide).

The Guide defines habitat for the species in Queensland as:

- **Habitat** which includes:
    - Regional ecosystems with confirmed greater glider records.
    - Habitat attributes (but not necessarily all attributes), such as live and dead hollow-bearing trees for denning, feed trees, large trees, habitat connectivity across the landscape.
- **Potential habitat** which includes:
    - Regional ecosystems that do not have confirmed greater glider records but are identified by experts as potential greater glider habitat.
    - Contains habitat attributes (but not necessarily all attributes), such as live and dead hollow-bearing trees for denning, feed trees, large trees, habitat connectivity across the landscape.
- **Not habitat** which includes:
    - Regional ecosystems with no confirmed records of greater gliders and identified by experts as non-habitat.
    - Does not contain habitat attributes such as live and dead hollow-bearing trees for denning, feed trees, large trees, habitat connectivity across the landscape.

As described in Section 3.0 of the Guide, qualified experts were engaged to identify the REs with a known or possible association with the species in Queensland. To compile this list, a literature and database review was completed that considered several factors including the intersection with high-precision records and expert opinion regarding the presence of habitat resources and/or known important tree species. Through this process, a total of 254 REs were confirmed as greater glider **habitat** and a further 124 were identified as **potential habitat**. At least 121 REs that occur within the species distribution and comprise a suitable vegetation structure (i.e. woodland or forest) were identified as **not habitat** by the experts. While the list of **habitat** and **potential habitat** REs is available and able to be reviewed for the purposes of this assessment, this is not the case for the list of REs considered **not habitat**.

Six tree species were identified as dominant or co-dominant species in the majority of greater glider habitat. These six species each have a broad distribution throughout the geographic range of Queensland's greater glider species. In descending order of extent, these were *Corymbia citriodora*, *Eucalyptus moluccana*, *Eucalyptus tereticornis*, *Eucalyptus crebra*, *Corymbia intermedia* and *Eucalyptus portuensis* (Eyre, Smith, *et al.*, 2022).

A list of tree species that may characterise the habitat and potential habitat REs is provided in Table 9 of Appendix B of the Guide. This list of tree species has been derived from the 'long description' in the REDD of the relevant REs and has not considered field-verified descriptions of the communities in which the record occurred. For many REs, the REDD long description includes species which may or may not be present, as well as species that may only be 'associated' and therefore occur as incidental individuals. It is also considered possible that some species within the list may also characterise REs that have been classified as **not habitat** by the experts. With the information currently available these characterisations cannot be investigated any further. As such, this list of species is not appropriate for identifying potential greater glider habitat.

This Guide also defines the importance of the size of trees for greater gliders, with trees >30 cm DBH preferentially selected for foraging and >50 cm DBH for denning. Certain tree species are favoured by greater gliders for foraging and contribute the bulk of the diet in any one area. Young foliage is selected if available and this can alter the pattern of forage tree selection at different times of the year (Eyre, Smith, *et al.*, 2022). For example, Comport, Ward and Foley (1996) found that foraging on *Eucalyptus tereticornis* and *Eucalyptus crebra* was variable, with gliders favouring the species in some months and avoiding them in others. Studies in the Brigalow Belt Bioregion found that favoured feed tree species included *Eucalyptus fibrosa, Eucalyptus moluccana* and *Corymbia citriodora*. However, this list may reflect bias in survey, localised effort and species availability and is not considered a complete list.

Patch size is likely to influence greater glider occupancy of habitat. Simulations suggest that habitat patches as small as 3 ha can contribute to the persistence of greater gliders, depending on the characteristics of landscape context (McCarthy and Lindenmayer 1999 in Eyre et al., 2022). Individual home ranges are typically relatively small (1–4 ha) but may reach up to 11 ha in hollow-limited environments (Smith et al. 2007). Greater gliders have been found in habitat patches <10 ha in some fragmented and remnant forest patches in the southern part of their geographic range (Pope et al. 2004; Lindenmayer 2002), but may require larger habitat patches in Queensland (Eyre 2006).

9.14.3 Threats

The greater glider is considered to be particularly sensitive to forest clearance and to intensive logging. Notwithstanding relatively small home ranges, but in part because of low dispersal ability, this species may be sensitive to fragmentation, have relatively low persistence in small forest fragments, and disperse poorly across vegetation that is not native forest. As per the species' Conservation Advice (Department of Climate Change, Energy, the Environment and Water, 2022a), known threats include:

- habitat loss and fragmentation
- inappropriate fire regimes
- timber harvesting
- barbed wire fencing entanglement
- climate change
- hyper-predation by owls
- competition from sulphur-crested cockatoos (*Cacatua galerita*)
- predation by feral cats (*Felis catus**) and foxes (*Vulpes vulpes**).

9.14.4 Occurrence and Potential Habitat

Recorded Occurrence within the Project Area and Region

The greater glider (southern and central) was not recorded during the field survey program. It is considered to have a high likelihood of occurring within the Project Area and is presumed present for the purposes of the assessment. The Project Area occurs within the species 'likely to occur' distribution extent as per SPRAT.

The species was recorded during surveys completed for three identified projects in the region surrounding the Project Area that have been referred in the last decade, including the Banana Range Wind Farm, Theodore Wind Farm and the Dawson West Mining Project (see **Section 6.2.2**).

Six ALA records (undated) associated with OZCAM occurs within the desktop search extent, located immediately west and south-east of the Project Area near the Dawson River and Castle Creek, respectively. Records of the species within the WildNet (Queensland Wildlife Data) database are also present. A total of 11 WildNet records occur within 20 km of the Project Area, including one unconfirmed, with dates ranging from 1992 to 2012.

The location of the 11 WildNet records was reviewed against State mapping to gain possible inferences about the species habitat preferences in the local area. By using GIS to intersect the records with the State RE mapping, it was determined that records were associated with homogenous polygons of RE 11.3.4, heterogenous polygons of RE 11.3.2/11.3.25 and non-remnant vegetation. Further investigation determined that all records were associated with the Dawson River itself or a tributary including Roundstone Creek, Castle Creek and unnamed watercourses. The locality description of one of the records (dated 2000 and verified) includes reference to an ephemeral wetland in the locality description. While it is acknowledged that greater gliders (southern and central) utilise a variety of eucalypt woodland communities on a range of substrates, it is hypothesised that in this region, the species may predominantly be supported by alluvial and riparian communities as they generally exhibit the greatest levels of connectivity.

Potential Habitat within the Project Area

Potential habitat for the greater glider (southern and central) within the Project Area was identified through a three-step process that first required a review of the field-verified vegetation community descriptions to determine what areas comprised eucalypt woodlands or forests. Then, these areas were analysed to determine whether they met the habitat definition. This required consideration of the dominant canopy species and a cross-check against the list of habitat and potential habitat REs as developed by the authors of the Guide (Eyre et. al 2022). The final step was an assessment of patch size, connectivity to other areas of habitat and landscape context. Consideration of the species known habitat utilisation in the local area based on the analysis of records as described above was also considered.

Of the 21 REs mapped within the Project Area (**Table 6.4**), five are identified by the Guide as habitat or potential habitat including REs 11.3.4, 11.3.25, 11.4.8, 11.5.2 and 11.9.2. Although the REDD short description indicates RE 11.4.8 is dominated by a eucalypt, findings from the field survey program determined that within the Project Area this community was consistently dominated by *Acacia harpophylla*. As this community does not comprise a eucalypt forest or woodland, it does not meet the definition of habitat for the species. Four REs are therefore considered to comprise potential greater glider (southern and central) habitat within the Project Area. No non-remnant communities recorded within the Project Area to date have comprised eucalypt woodland or forest.



Photo 9.6 Representative image of RE 11.4.8 within the Project Area

As described above, another key consideration in the mapping of potential greater glider (southern and central) habitat for the purposes of this impact assessment was connectivity. The Project Area is brownfield and highly developed, with the dominant land use agriculture. To facilitate such land use, significant historical land clearing has occurred across the majority of the site with many patches of vegetation now surrounded by cleared land or part of loose habitat corridors with frequent gaps. For the purposes of this assessment, a 'corridor' refers to a series of habitat patches (any combination of 'denning' and 'foraging and dispersal' patches) that are separated by distances the species is capable of gliding across, based on its glide angle (40°) and the height of the vegetation.

As tree height data is not consistently available, patch/corridor size and connectivity was assessed using recent aerial imagery and a conservative maximum glide distance of 100 m. Literature on the species maximum glide distance varies significantly, from 40 m (QLD Government, 2024), 75 m (Taylor & Goldingay, 2009) and 100 m (McCarthy & Lindenmayer, 1999 in Norman and Macke, 2024). As such, subsequent field scouts will assess connectivity using tree height data specific to the location and the known gliding angle.

The patch was considered isolated (and thus not part of a corridor) if it was separated from habitat by 100 m or greater at the narrowest point, or surrounded by vegetation that does not meet the habitat definition (either utilisation category). The species is not known to utilise other habitat for any part of their lifecycle including dispersal. This includes brigalow woodlands and non-remnant vegetation with isolated trees. As such, some patches that comprise habitat or potential REs have not been mapped as potential habitat (**Figure 9.18**).

A total of 1,187.1 ha of potential greater glider (southern and central) habitat is mapped within the Project Area comprising vegetation in both remnant and regrowth condition (**Figure 9.17**). Accurate tree size and height data for the Project Area is limited; the majority of field survey scopes did not allow for this level of detail to be captured and were completed prior to the latest Conservation Advice being published. As such, a conservative approach to the mapping has been undertaken that currently considers all identified habitat within the Project Area to be suitable for denning purposes. All areas proposed for clearing will still be subject to assessment (field scout) by a suitably qualified ecologist who will assess habitat suitability in consideration of the species habitat definitions, tree DBH and height (>30 cm DBH and >10 m height).

The extent of greater glider (southern and central) habitat within the Project Area is provided below in **Table 9.28**, and the mapped habitat is shown on **Figure 9.17**.

Table 9.28 Habitat Extent for Greater Glider (southern and central)

Habitat Utilisation	Habitat Definition	Extent within the Project Area (ha)
Denning	Eucalypt forests and woodlands (patches or corridors ≥3 ha) that support potential hollow-bearing trees, comprising habitat or potential habitat regional ecosystems (REs), OR REs dominated or co-dominated by the primary associated canopy species (listed below) as per Eyre, Smith, et al. (2022). Eucalypt forests and woodlands that support potential hollow bearing trees but do not align with an RE (i.e. non-remnant communities) may also comprise habitat where dominated by *Corymbia intermedia*, *Corymbia citriodora*, *Eucalyptus tereticornis*, *Eucalyptus portuensis*, *Eucalyptus moluccana* and/or *Eucalyptus crebra*.	1,187.1
Foraging and dispersal[9]	Eucalypt forests and woodlands (patches or corridors ≥3 ha) with a canopy height >10 m that do not support potential hollow-bearing trees, comprising habitat or potential habitat regional ecosystems (REs), OR REs dominated or co-dominated by the primary associated canopy species (listed below) as per Eyre, Smith, et al. (2022). Eucalypt forests and woodlands that do not align with an RE (i.e. non-remnant communities) may also comprise habitat where dominated by *Corymbia intermedia*, *Corymbia citriodora*, *Eucalyptus tereticornis*, *Eucalyptus portuensis*, *Eucalyptus moluccana* and/or *Eucalyptus crebra*. Foraging and dispersal habitat (individual patch or corridor) must occur within gliding distance (calculated based on known glide angle and tree height, or 100 m if not able to calculate accurately) of denning habitat, given the species' reliance on hollow-bearing trees to shelter during the day.	0.0[1]
	Total	**1,187.1**

[9] This habitat category was unable to be accurately mapped for the purposes of this assessment with the data available. A conservative approach to the mapping has been undertaken that currently considers all identified habitat within the Project Area to be suitable for denning purposes, although it is noted many of the areas identified as denning are most likely foraging and dispersal only. All areas proposed for clearing will still be subject to assessment (field scout) by a suitably qualified ecologist who will assess habitat suitability in consideration of the species habitat definitions, tree DBH and height (>30 cm DBH and >10 m height).

Mapped potential habitat for the species within the Project Area is predominately concentrated within the riparian habitat corridor along the Dawson River where remnant vegetation with the potential to bear hollows exists and connectivity is afforded. Only small portions of the riparian vegetation along the Dawson River have been field validated. In these locations, vegetation is dominated by *Eucalyptus tereticornis* and analogous with RE 11.3.25. However, as per the State RE mapping, large areas of RE 11.3.2 are also mapped on the Dawson River. Although this RE is not listed as a habitat or potential habitat RE by the Guide (Eyre, Smith, *et al.*, 2022), it is considered likely in this specific location, the RE is either absent (given only RE 11.3.25 verified in that location so far) or occurs as small patches interspersed with RE 11.3.25 and forms part of a habitat matrix. As such, areas of RE 11.3.2 associated with the Dawson River are considered to comprise potential habitat. A single patch of RE 11.3.27f also occurs within the Project Area, located immediately adjacent to the Dawson River and has also been included. It is also noted that the inclusion of these communities in this context as potential habitat aligns with the analysis of local WildNet records.

Several small and disjunct patches of known habitat REs (RE 11.3.25, 11.3.4 and 11.5.2) have also been included where they form a loose vegetated tract. Due to the high levels of fragmentation and exposure to predators, these areas are considered unlikely to support a population of the species. Any individuals or populations that could potentially exist within these patches would be vulnerable to deleterious impacts associated with isolated habitat such as reduced genetic diversity and increased susceptibility to stochastic events. Given the inclusion of these areas, as well as patches that may not contain hollow-bearing trees or trees above the relevant large tree thresholds, the mapping of potential greater glider habitat within the Project Area is considered conservative.

It is also noted that the extent of potential habitat mapped within the Project Area largely aligns with the DES (2022) predicted habitat model for the species developed using Maxent (see **Figure 9.19**). As per the model results, areas associated with higher order waterways are generally 20–40% likely to contain suitable habitat, while the remainder of the Project Area is either 10–20% likely to contain suitable habitat or <10% likely. The DES model results also support the assertion that habitat mapping completed for the Project is conservative, as it is likely that a combination of factors affecting the Project Area have reduced the suitability of habitat for the species over time.

9.14.5 Important Populations

Superseded iterations of the *Conservation Advice for the Greater Glider* (in effect when the species was listed as Vulnerable) did not identify important populations for the species. The current Conservation Advice (Department of Climate Change, Energy, the Environment and Water, 2022a) notes that '*given its Endangered status, all populations of the greater glider (southern and central) are important for the conservation of the species across its range.*'

Despite the impact assessment using the Vulnerable criteria, this assessment of important populations has taken a conservative approach and considers that all populations of the species are considered important.

9.14.6 Habitat Critical to the Survival of the Species

Habitat critical to the survival of the greater glider (southern and central) is defined in the species Conservation Advice (Department of Climate Change, Energy, the Environment and Water, 2022a) as:

- Large contiguous areas of eucalypt forest, which contain mature hollow-bearing trees and a diverse range of the species' preferred food species in a particular region.

- Smaller or fragmented habitat patches connected to larger patches of habitat, that can facilitate dispersal of the species and/or that enable recolonisation.
- Cool microclimate forest/woodland areas (e.g. protected gullies, sheltered high elevation areas, coastal lowland areas, southern slopes).
- Areas identified as refuges under future climate changes scenarios.
- Short-term or long-term post-fire refuges (i.e. unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonise burnt areas.

Habitat associated with the riparian zone of the Dawson River is likely to meet all aspects of the definition of habitat critical to the survival of the species as it is contiguous and can facilitate dispersal of the species, contains tree species which are likely to be preferred food species and could provide refuge under future climate change scenarios. Although limited data on tree DBHs or the full diversity of tree species is available, the tree species typical of the vegetation communities present are known to bear hollows and hence it is assumed that hollows are present in suitably density to sustain a local population.

Notwithstanding the above, all potential habitat that is confirmed to meet the habitat definition during future field scouts will be considered habitat critical to the survival of the species. All areas of habitat outside of the Dawson River corridor meet the definition as they comprise smaller or fragmented habitat patches connected to larger patches of habitat, that can facilitate dispersal of the species and/or that enable recolonisation.

9.14.7 Potential Project Impacts and Key Mitigation Measures

Over the life of the Project, Westside have committed to a cumulative maximum disturbance of 2.0 ha of foraging and dispersal habitat. No direct impacts on greater glider denning habitat are permitted at any time throughout the life of the Project.

To ensure patch viability and functionality is maintained at current levels, the siting of Project infrastructure (including wells, gathering infrastructure, tracks and other ancillary infrastructure) within or adjacent to moderate constraint areas (such areas are limited to foraging and dispersal habitat for this species) will adhere to the following rules:

- Patches that are 0.5 ha or less must be completely avoided by the Project (no direct impacts permitted).
- Patches that are 1.0 ha or less must not be dissected in a way that creates two new patches.
- Direct impacts must not reduce the patch size to less than 0.5 ha OR isolate the patch by more than 50 m to the nearest patch (unless already isolated by more than 50 m).
- Patches >1.0 ha must not be dissected in a way that creates one patch <0.5 ha.

Potential indirect impacts on greater glider (central and southern) as a result of the Project include:

- Alterations to fire regimes and potential for increased accidental bushfire that may result from construction and/or operation.

- Increased incidence of feral predators.
- Noise, activity and vibration generated during construction and operation interrupting foraging, breeding or dispersal behaviours.
- Dust generated during construction activities disturbing behaviours or health/palatability of foraging resources.

General mitigation measures are outlined in **Section 8.2.1**. Mitigation measures specific to greater glider (central and southern) are outlined in **Section 8.2.2** and below:

- Threatened fauna individuals and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of threatened fauna habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped).
- No direct impacts are permitted to greater glider (southern and central) denning habitat (maximum disturbance limit of 0.0 ha). Direct impacts to greater glider (southern and central) foraging and dispersal habitat are permitted only to a cumulative maximum disturbance limit of 2.0 ha.
- When clearing greater glider (southern and central) foraging and dispersal habitat, micro-siting will aim to retain the tallest trees present within the assessed area, to ensure availability of gliding launch points is retained.
- During the field scouts, qualified ecologists will assess tree height and size to determine if an area meets the habitat definition and how habitat exists functionally in the landscape (i.e. as an isolated patch or as a habitat corridor). This data will inform the assessment of impacts to dispersal habitat including potential changes in habitat functionality, completed in subsequent reporting.
- Where clearing is proposed within a greater glider (southern and central) habitat corridor, as defined in the MNES habitat criteria, field scout data collected by a qualified ecologist will be used to understand how much wider existing gaps can be made. Clearing required for construction of the Project will not create gaps in the habitat corridor that are too great for the species to glide across (i.e. turn the corridor into two isolated patches or corridors). This is further defined in the greater glider (southern and central) habitat criteria (**Appendix C**).
- In the unlikely event that a greater glider (central and southern) is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days.
- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.
- Measures outlined in the Westside Noise Management Plan (WCL-0000-HS-PLN-009), Erosion and Sediment Control Procedure (WCL-0000-HS-PRC-029) and Weed Management Procedure (WCL-0000-HS-PRC-034) will be implemented to minimise indirect impacts to the species.

9.14.8 Significant Impact Assessment

The significant impact assessment for this species is presented in **Table 9.29** below. In summary, the assessment found that the Project is **unlikely to result in a significant impact on the greater glider (southern and central)**. The species listing status at the time of the Project's original referral (Vulnerable) has been considered in the below assessment, particularly as it pertains to the severity of impacts on habitat critical to the survival of the species. Broadly speaking, Critically Endangered or Endangered MNES are considered most vulnerable to exacerbation or synergistic impacts associated with threatening processes, given they are likely to comprise small populations less resilient to stochastic events. Although the listing status of Vulnerable was used, the assessment of potential impacts was informed by the latest literature on the species including the Conservation Advice, which was updated in response to the listing change in 2022.

Table 9.29 Significant Impact Assessment – Greater Glider (central and southern)

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Lead to a long-term decrease in the size of an important population of a species	The greater glider (southern and central) was not recorded during the field surveys, however is known from the wider region based on records from other ecological surveys and public records. Any individuals present within the Project Area may comprise an important population. Based on field survey findings and State mapping, the Project Area supports suitable habitat. The primary habitat identified to date is associated with the riparian zone of the Dawson River, which was confirmed during the field survey program to support key habitat features (hollow-bearing trees) that are otherwise limited in the wider Project Area. Mapped habitat identified across the remainder of the Project Area largely comprises narrow linear patches that form loose habitat corridors with frequent gaps. Field survey findings indicate that riparian habitat on other mapped watercourses within the Project Area is frequently interspersed by areas of brigalow woodland, which are not known to be utilised by the species. A conservative approach to the habitat mapping has been undertaken, noting that all proposed infrastructure locations (and areas within 30 m) will be subject to assessment by a qualified ecologist. Potential habitat will be assessed in consideration of the habitat mapping criteria that include requirements relating to tree height, patch size and connectivity. All areas identified as suitable for denning will be strictly avoided (maximum disturbance limit of 0.0 ha). Direct impacts as a result of vegetation clearing required for the Project may be required to habitat suitable for foraging and dispersal purposes, to a maximum disturbance limit of 2.0 ha. The siting of Project infrastructure (including wells, gathering infrastructure, tracks and other ancillary infrastructure) within or adjacent to foraging and dispersal habitat will adhere to patch viability and functionality rules (described in **Section 9.14.7** above). These measures will ensure that habitat functionality for the species is maintained and habitat fragmentation is not significantly exacerbated. Therefore, the quantum of foraging and dispersal habitat that will be retained will be sufficient to maintain any population present.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
	Indirect impacts on the species as a result of the Project are expected to be limited. Populations of pest species which may predate on the greater glider (southern and central) (i.e. feral cat and red fox) are likely to be already established in the Project Area and the best practice pest management measures will be enforced as defined in the Biosecurity Management Plan (WCL-0000-HS-PLN-010-010). Construction activities and ongoing vehicle use within the Project Area may increase the ignition potential of vegetation, although bushfire attributable to the Project would be managed via the EMP. As a result of increased activity in the Project area, noise disturbance would be elevated, however works will occur primarily during the day. All greater glider (southern and central) denning habitat will be avoided (i.e. where the species is likely to shelter during the day), hence disturbance would be limited to areas only utilised periodically at night. Given the above, a long-term decrease in the size of a greater glider (southern and central) population is unlikely.	
Reduce the area of occupancy of an important population	It is considered highly likely that any local population present, which would constitute an important population, is predominantly confined to the Dawson River corridor where high quality, connected habitat is supported. No direct impacts will occur to confirmed denning habitat, including along the Dawson River. Although directional drilling may occur underneath, entry and exit points will occur well outside of the riparian zone and construction will be subject to detailed planning. The risks associated with directional drilling are considered low as they are frequently employed on CSG projects to manoeuvre around watercourses. As described above, no direct impacts will be permitted to areas of denning habitat, confirmed via the field scout process. Direct impacts may occur to habitat suitable for foraging and dispersal purposes, to a maximum disturbance limit of 2.0 ha. However such habitat is likely to be widely available (relative to habitat suitable for denning) and used only temporarily by individuals while dispersing to higher quality areas of habitat. With the maintenance of habitat connectivity in line with baseline levels, this loss of habitat is likely to have a very minor impact on the species. Furthermore, the Project Area is not located near the limit of the species range, nor will it create any barriers to movement. Therefore, it is unlikely that the Project will result in a reduction in the area of occupancy of an important population.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Fragment an existing important population into two or more populations	As described above, up to 2.0 ha of habitat suitable for foraging and dispersal purposes only may be cleared across the life of the Project. Such habitat does not contain hollow-bearing trees, which the species is dependent on, and is therefore likely to be used only temporarily. Project works will be staged, ensuring impacts are limited to small discrete areas at a time. The siting of Project infrastructure will follow the Permit to Disturb process including strict rules regarding patch viability and functionality (described in **Section 9.14.7** above). Where clearing is proposed within a greater glider (southern and central) habitat corridor, as defined in the MNES habitat criteria, field scout data collected by a qualified ecologist will be used to understand how much wider existing gaps can be made. Clearing required for construction of the Project will not create gaps in the habitat corridor that are too great for the species to glide across (i.e. turn the corridor into two isolated patches or corridors). These measures will ensure that habitat functionality for the species is maintained and habitat fragmentation is not significantly exacerbated. The quantum of foraging and dispersal habitat that will be retained will be sufficient to maintain any population present. Project infrastructure will not create any barriers to movement. Noting this and the detailed field scout process that will be undertaken prior to any disturbance, it is considered unlikely the Project will fragment an existing important population into two or more.	Unlikely
Adversely affect habitat critical to the survival of a species	All potential habitat that is confirmed to meet the habitat definition during future field scouts will be considered habitat critical to the survival of the species. Although foraging and dispersal habitat lacks hollow-bearing trees, these areas provide important linkage to areas that do contain such resources and may be important to maintain individual home ranges. No direct impacts will be permitted to areas of denning habitat, confirmed via the field scout process. Direct impacts may occur to habitat suitable for foraging and dispersal purposes, to a maximum disturbance limit of 2.0 ha. The siting of Project infrastructure will follow the Permit to Disturb process including strict rules regarding patch viability and functionality (described in Section 9.14.7 above). Micro-siting of Project infrastructure will aim to retain the tallest trees present within the assessed area, to ensure availability of gliding launch points is retained. Additionally, where clearing is proposed within a greater glider (southern and central) habitat corridor, as defined in the MNES habitat criteria, field scout data collected by a qualified ecologist will be used to understand how much wider existing gaps can be made. Clearing required for construction of the Project will not create gaps in the habitat corridor that are too great for the species to glide across (i.e. turn the corridor into two isolated patches or corridors). These measures will ensure that habitat functionality for the species is maintained, and habitat fragmentation is not significantly exacerbated. Given the linear and staged nature of the Project, this habitat loss will be incremental and limited to very small areas per location comprising patch edges. Construction will be limited to small discrete portions of the Project Area at any one time, minimising disturbance. The quantum of foraging and dispersal habitat that will be retained will be sufficient to maintain any population present.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
	This magnitude of habitat loss is considered very minor, particularly noting that high quality habitat areas such as the Dawson River corridor, which are likely to be preferentially used, will be completely avoided. Overall, the project is considered unlikely to have an adverse impact on habitat critical to the survival of the species, given the strict mitigation and management measures in place that consider the species biological characteristics and known habitat preferences.	
Disrupt the breeding cycle of an important population	The species is reliant on hollow-bearing trees for breeding and has a low reproductive rate. Females give birth to a single young between March – June (McKay, 2008). To avoid disturbance to breeding individuals, no direct impacts will be permitted to confirmed greater glider (southern and central) denning habitat (i.e. where the species is likely to shelter during the day). Habitat suitable for denning will be marked as a 'high constraint' area and therefore only walk-over activities will be permitted (surveys with no ground disturbance). Potential indirect impacts on the species are expected to be low, however will be managed nonetheless via the Project management plans. Overall, the Project is considered highly unlikely to disrupt the breeding cycle of a greater glider (southern and central) population, noting habitat supporting hollow-bearing trees will be completed avoided.	Unlikely
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	While no direct impacts will occur to denning habitat, the results of habitat clearance within the Project Area (including to areas of foraging and dispersal) may indirectly impact the species via: increased incidence of feral cat/red fox and increased noise, light and dust. Pest species which may predate on greater glider (southern and central) such as red fox and feral cat, are likely established throughout the Project Area. Predation by these species is likely limited as greater gliders (southern and central) would only be susceptible to attack when they come to the ground, which is uncommon. Greater gliders are known to come to ground after they have been displaced by bushfires, which suggest that fire-predation interactions may amplify this threat to the species. Bushfire can also lead to significant population decline as a result of lethal heating or suffocation from smoke, or indirectly from loss of habitat features and resources. Edge effects are not expected to be amplified significantly as the Project Area is already highly fragmented and weed species are established throughout. Light spill and increased noise are expected to be temporary and localised and increased noise and light would be separated from areas potentially occupied by greater glider (southern and central) given that no construction works will occur in this habitat. The scale of indirect impact is considered to be minimal given the current condition of the Project Area and the presence and extent of existing threats. Nevertheless, potential impacts will be actively managed via the Project's management plans. Indirect impacts on the species are anticipated to be minor with the implementation of the strict infrastructure siting rules and the suite of mitigation and management measures, it is unlikely that the species would decline.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Stomach contents analysis of red fox and feral cat has demonstrated that these species are known to consume the greater glider (southern and central), albeit rarely. In these instances, it is unknown if they were killed by these species or consumed as carrion. Populations of both of these species are likely already established throughout the Project Area. The risk presented by these species is minimal as greater gliders (southern and central) are only susceptible to attack when they come to the ground. The species is rarely found on the ground, however they have been recorded in rare circumstances to disperse over the ground when there is a barrier to gliding and have also been recorded on the ground during drought or extreme heat or when displaced by bushfire. With the successful implementation of mitigation measures, the overall risk of invasive species establishment or exacerbation within the Project Area is minor and an increase in predatory interactions with greater glider (southern and central) is likely to be negligible.	Unlikely
Introduce disease that may cause the species to decline	The species is not known to be vulnerable to disease directly. Phytophthora root fungus (*Phytophthora cinnamomi*) has the potential to indirectly impact the species via the infection of eucalyptus trees. No signs of phytophthora root fungus were observed during field surveys. The Project will implement appropriate biosecurity protocols, therefore the introduction of a disease that may cause the species to decline is unlikely.	Unlikely
Interfere substantially with the recovery of the species	There is no adopted or made Recovery Plan for this species. Clearing and logging activities, current burning regimes and the impacts of climate change are a major threat to large hollow-bearing trees upon which the species relies. The Project will be designed to preferentially utilise previously disturbed areas and full avoidance of habitat suitable for denning (and thus relied upon for the long-term persistence of the species) has been committed to. As such, the Project is unlikely to interfere with the recovery of the species.	Unlikely

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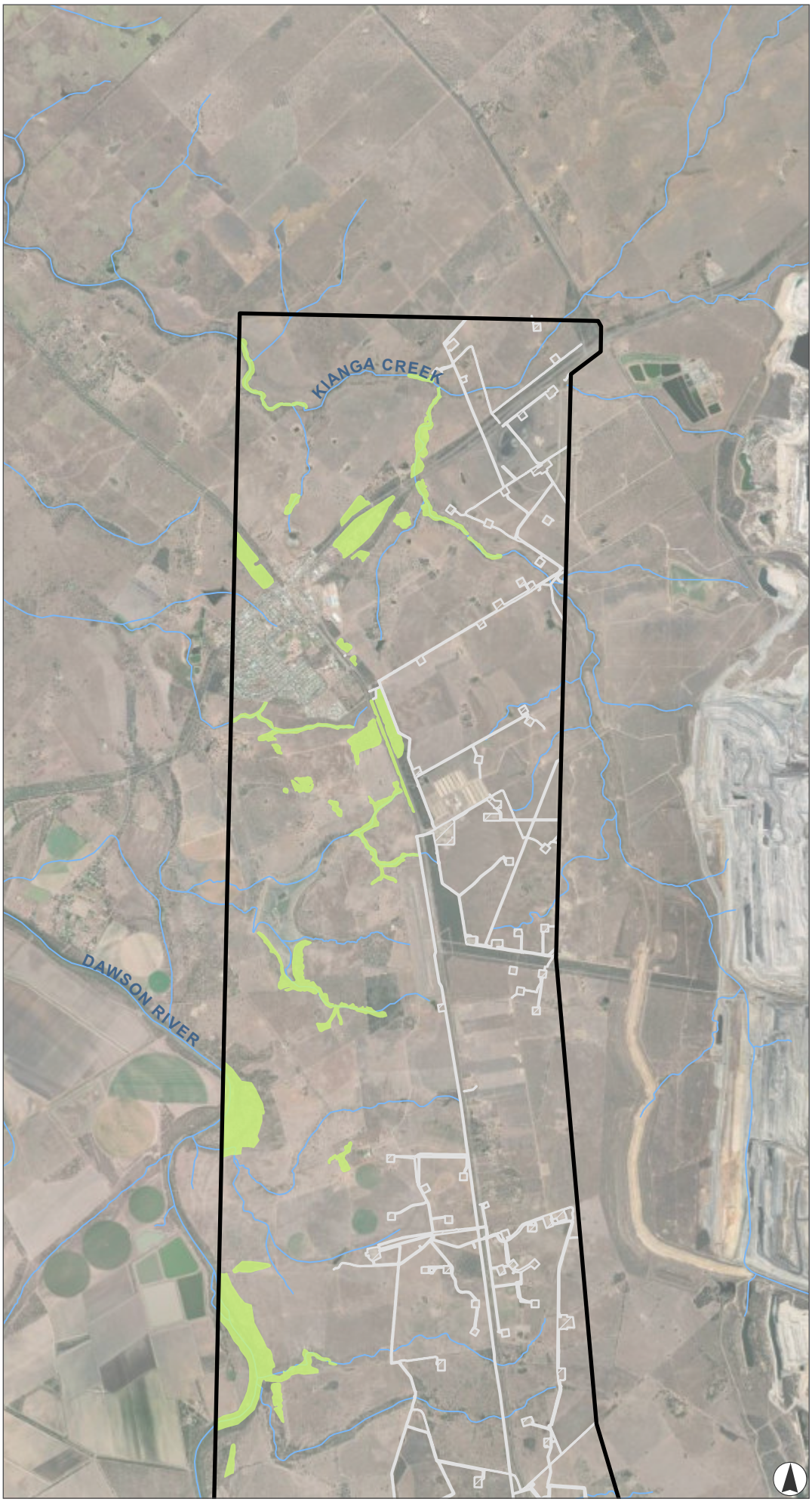


FIGURE 9.17A

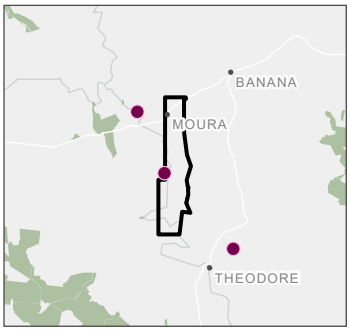
Greater glider (southern and central) *(Petauroides volans)* Habitat and Records

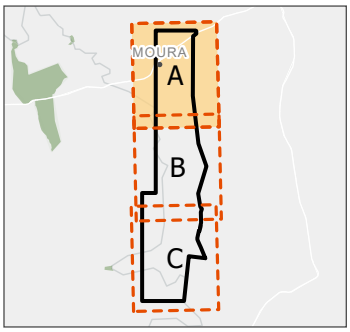
Legend

- ALA Records of Greater glider (southern and central)
- Watercourse
- Project Area
- Existing Westside infrastructure

Greater glider (southern and central) Habitat

- Denning





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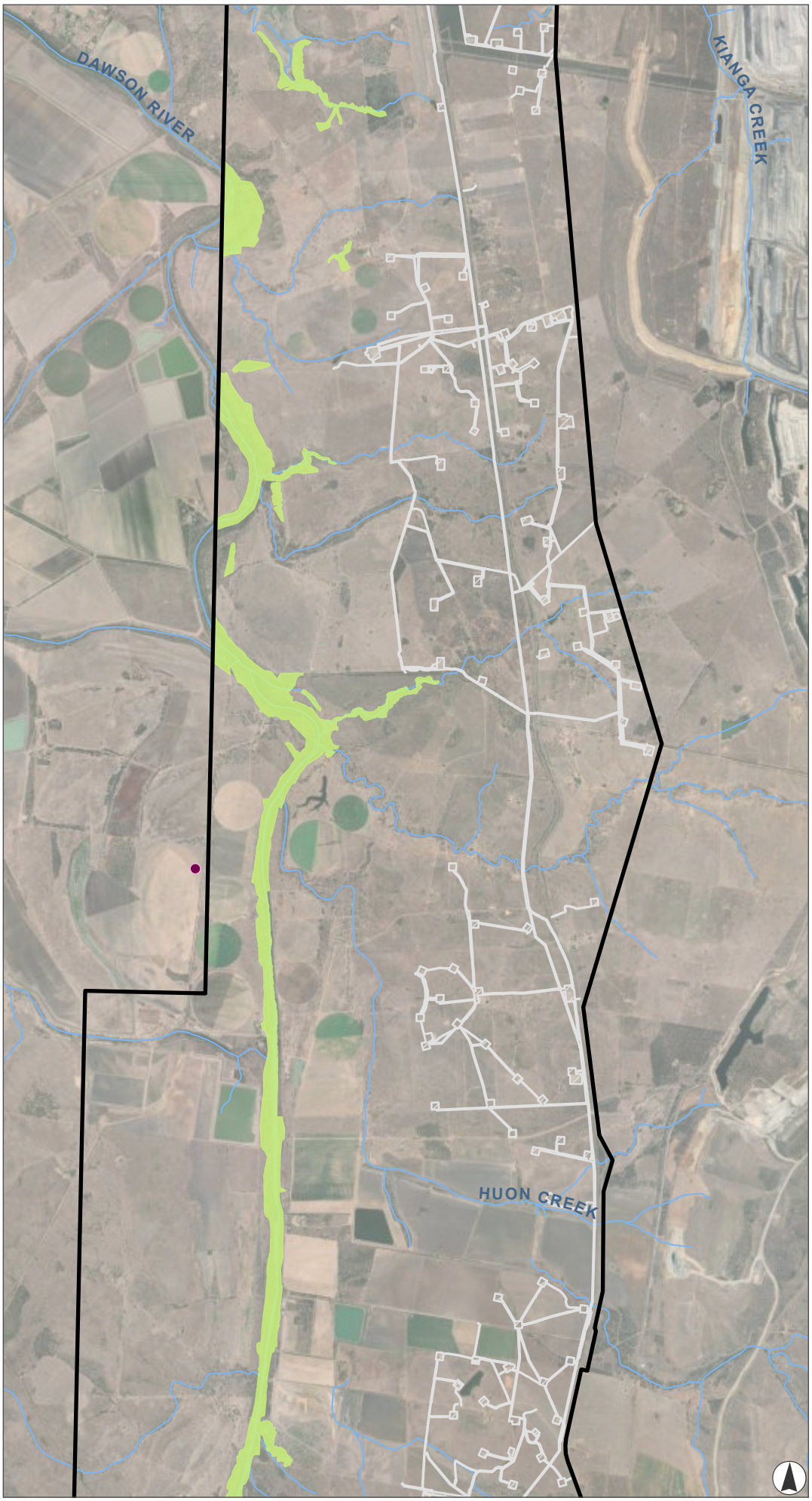


FIGURE 9.17B

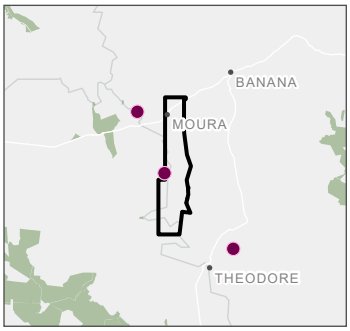
Greater glider (southern and central) *(Petauroides volans)* Habitat and Records

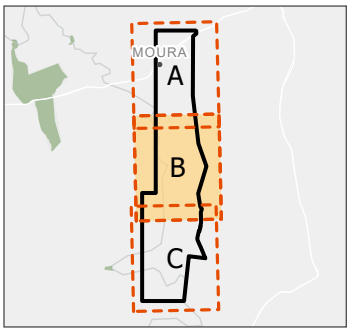
Legend

- ALA Records of Greater glider (southern and central)
- Watercourse
- Project Area
- Existing Westside infrastructure

Greater glider (southern and central) Habitat

- Denning





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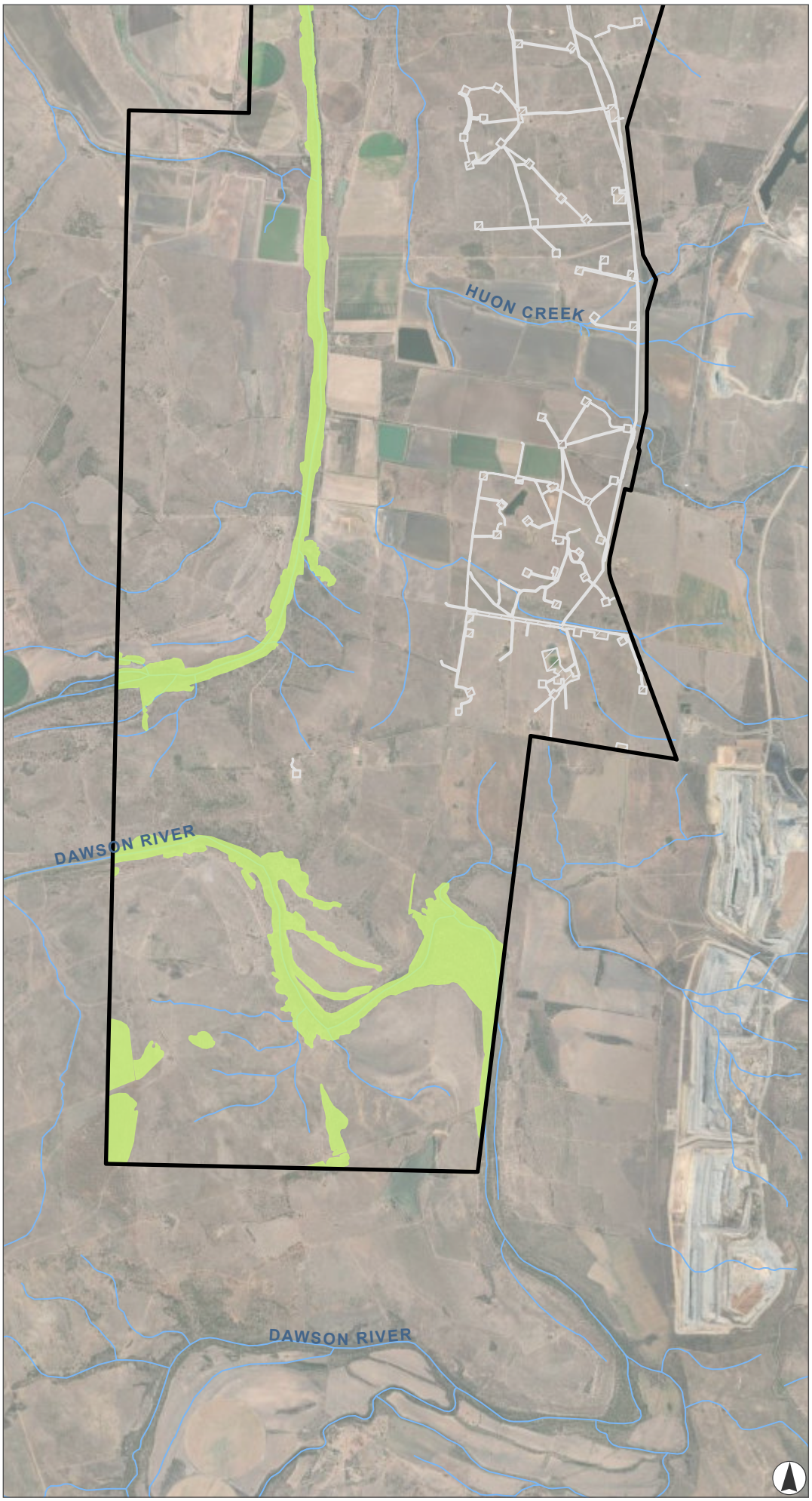


FIGURE 9.17C

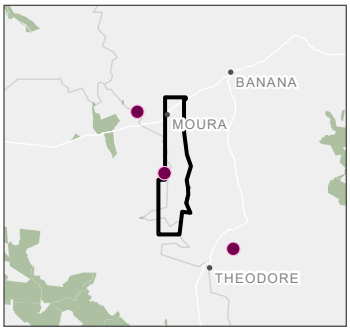
Greater glider (southern and central) *(Petauroides volans)* Habitat and Records

Legend

- ALA Records of Greater glider (southern and central)
- Watercourse
- Project Area
- Existing Westside infrastructure

Greater glider (southern and central) Habitat

- Denning



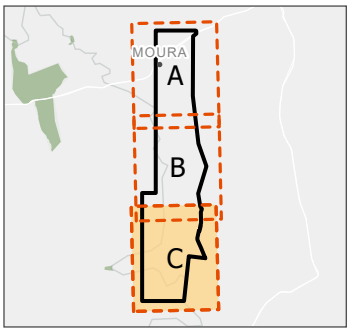


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FIGURE 9.18A

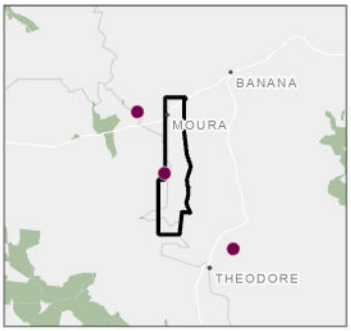
Greater glider (southern and central) *(Petauroides volans)* Habitat - Patches Excluded Shown

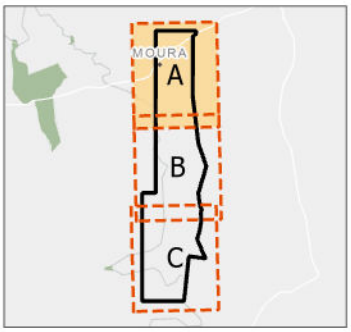
Legend

- ALA Records of Greater glider (southern and central)
- Watercourse
- Project Area
- Existing Westside infrastructure

Greater glider (southern and central) Habitat

- Denning
- Not Greater glider (southern and central) habitat due to patch size and connectivity





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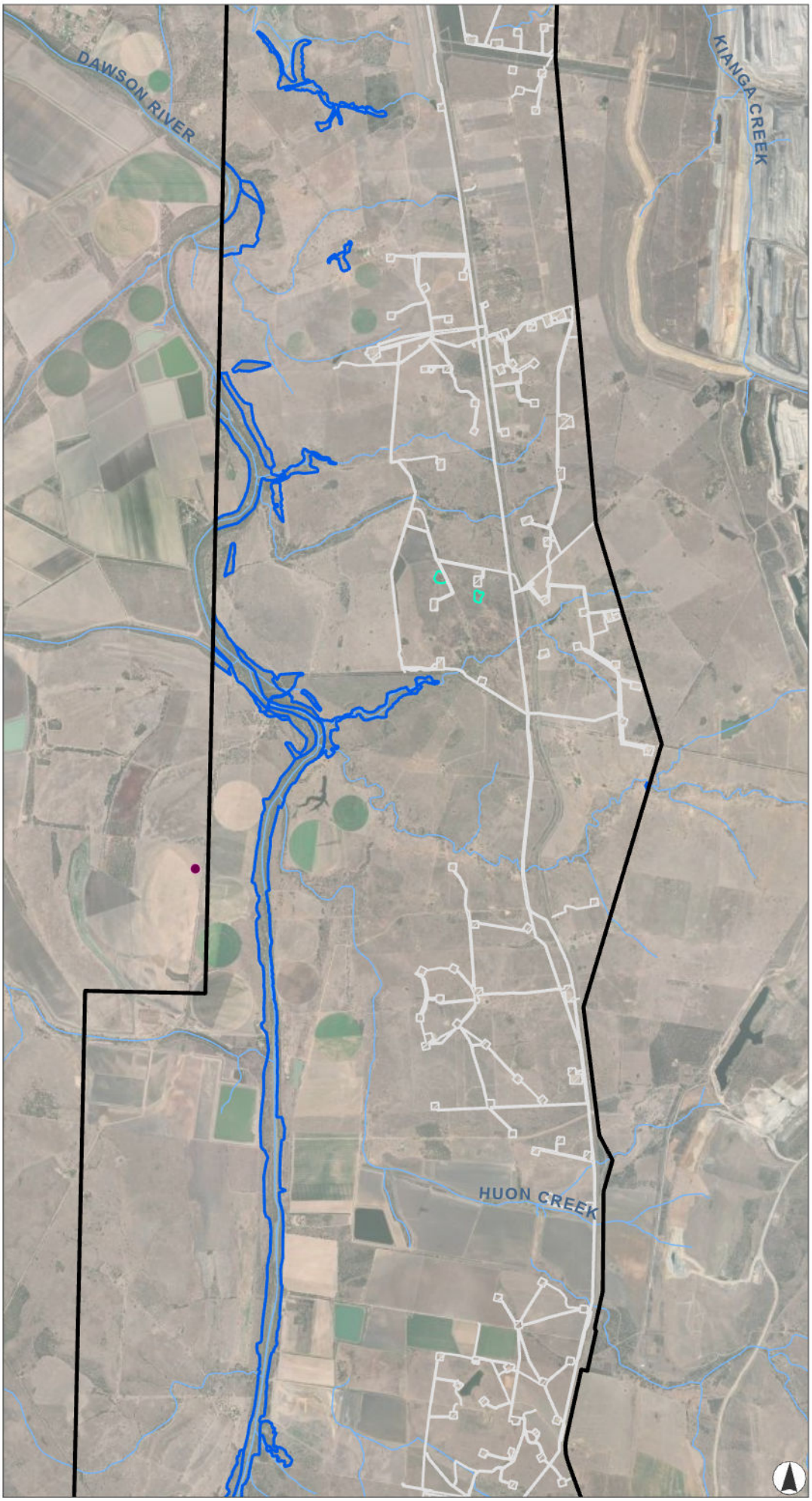


FIGURE 9.18B

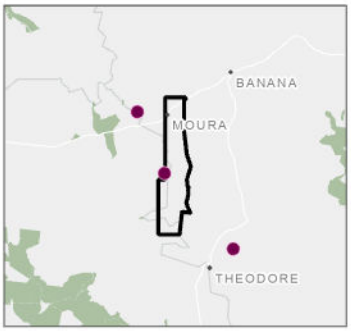
Greater glider (southern and central) *(Petauroides volans)* Habitat - Patches Excluded Shown

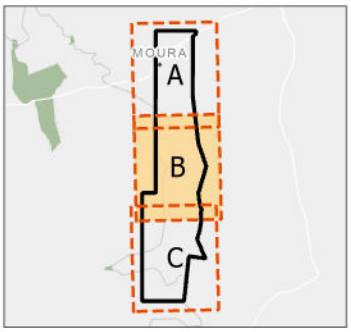
Legend

- ALA Records of Greater glider (southern and central)
- Watercourse
- Project Area
- Existing Westside infrastructure

Greater glider (southern and central) Habitat

- Denning
- Not Greater glider (southern and central) habitat due to patch size and connectivity





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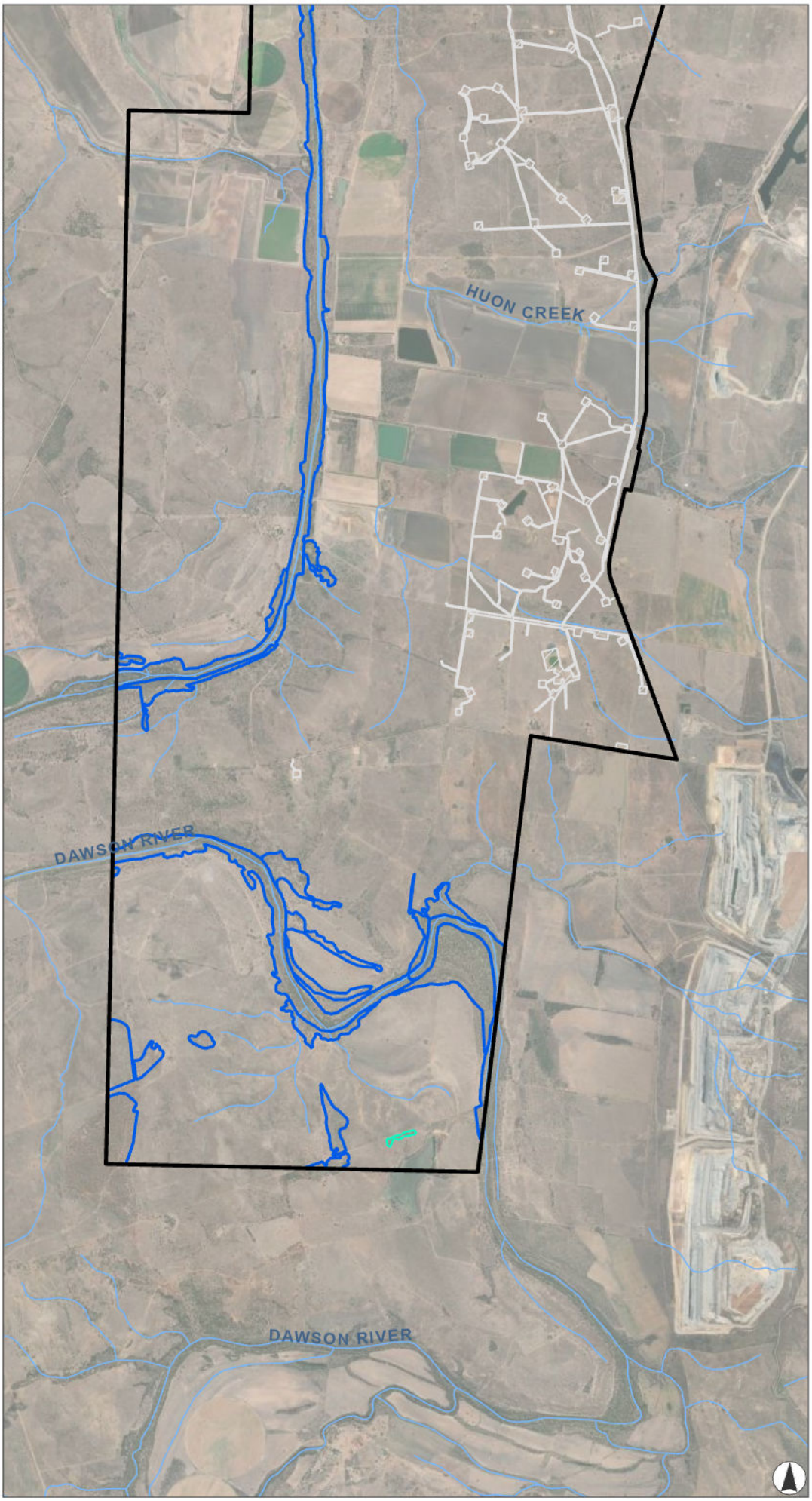


FIGURE 9.18C

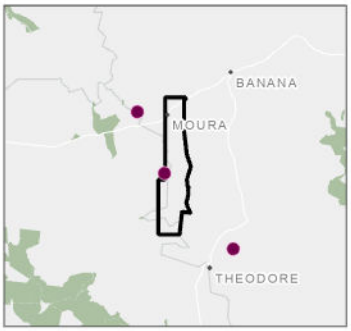
Greater glider (southern and central) *(Petauroides volans)* Habitat - Patches Excluded Shown

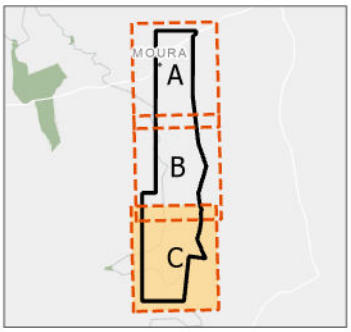
Legend

- ALA Records of Greater glider (southern and central)
- Watercourse
- Project Area
- Existing Westside infrastructure

Greater glider (southern and central) Habitat

- Denning
- Not Greater glider (southern and central) habitat due to patch size and connectivity





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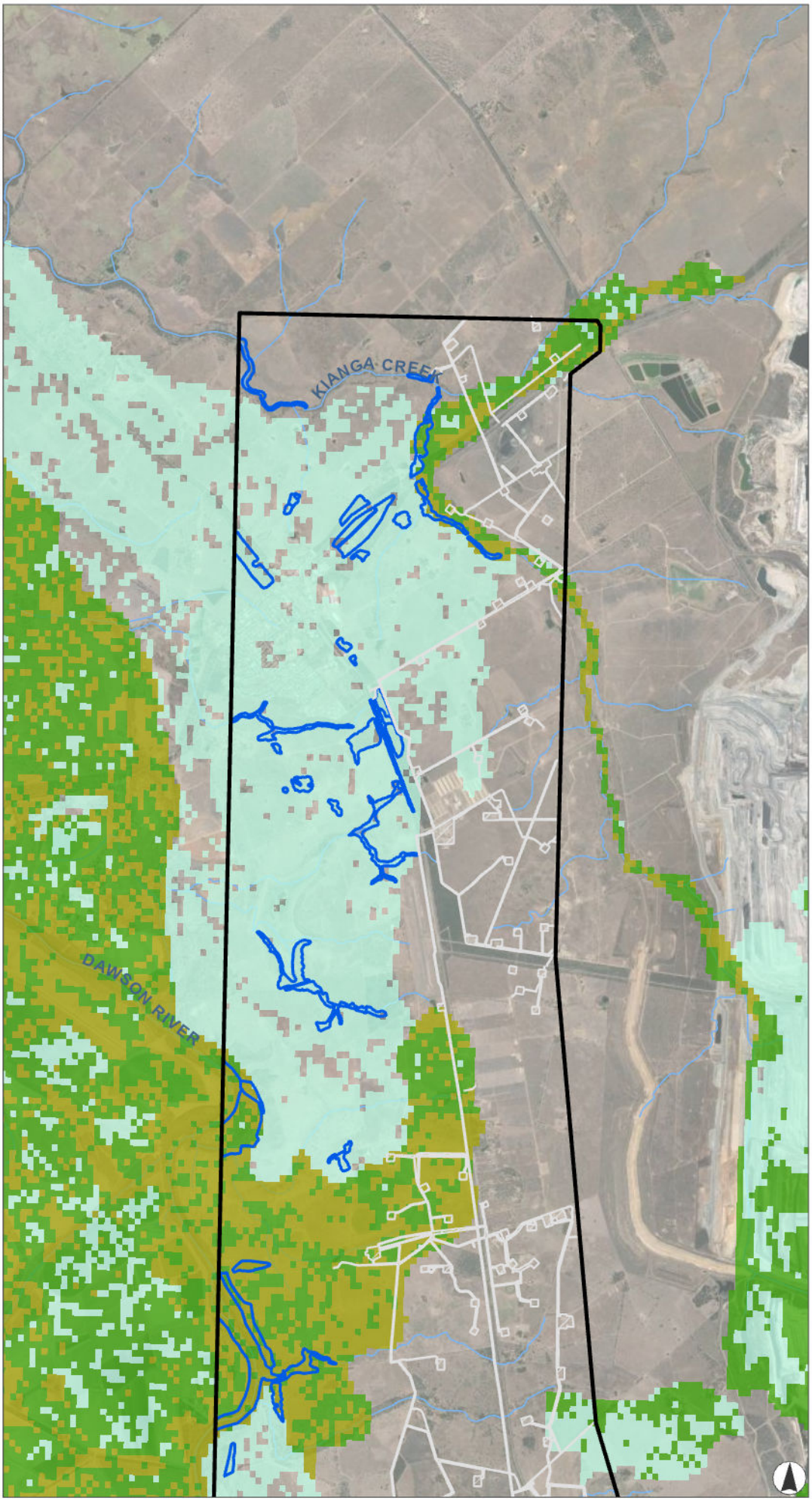


FIGURE 9.19A

Greater glider (southern and central) *(Petauroides volans)* Habitat with DES Habitat Model

Legend

- ALA Records of Greater glider (southern and central)
- Watercourse
- Project Area
- Existing Westside infrastructure

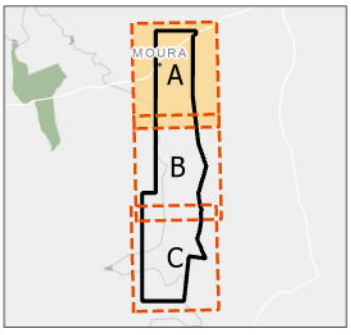
Greater glider (southern and central) Habitat

- Denning

DES (2022) Habitat Suitability Model

Petauroides volans - Likelihood Area Comprises Suitable Habitat (%)

- < 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100



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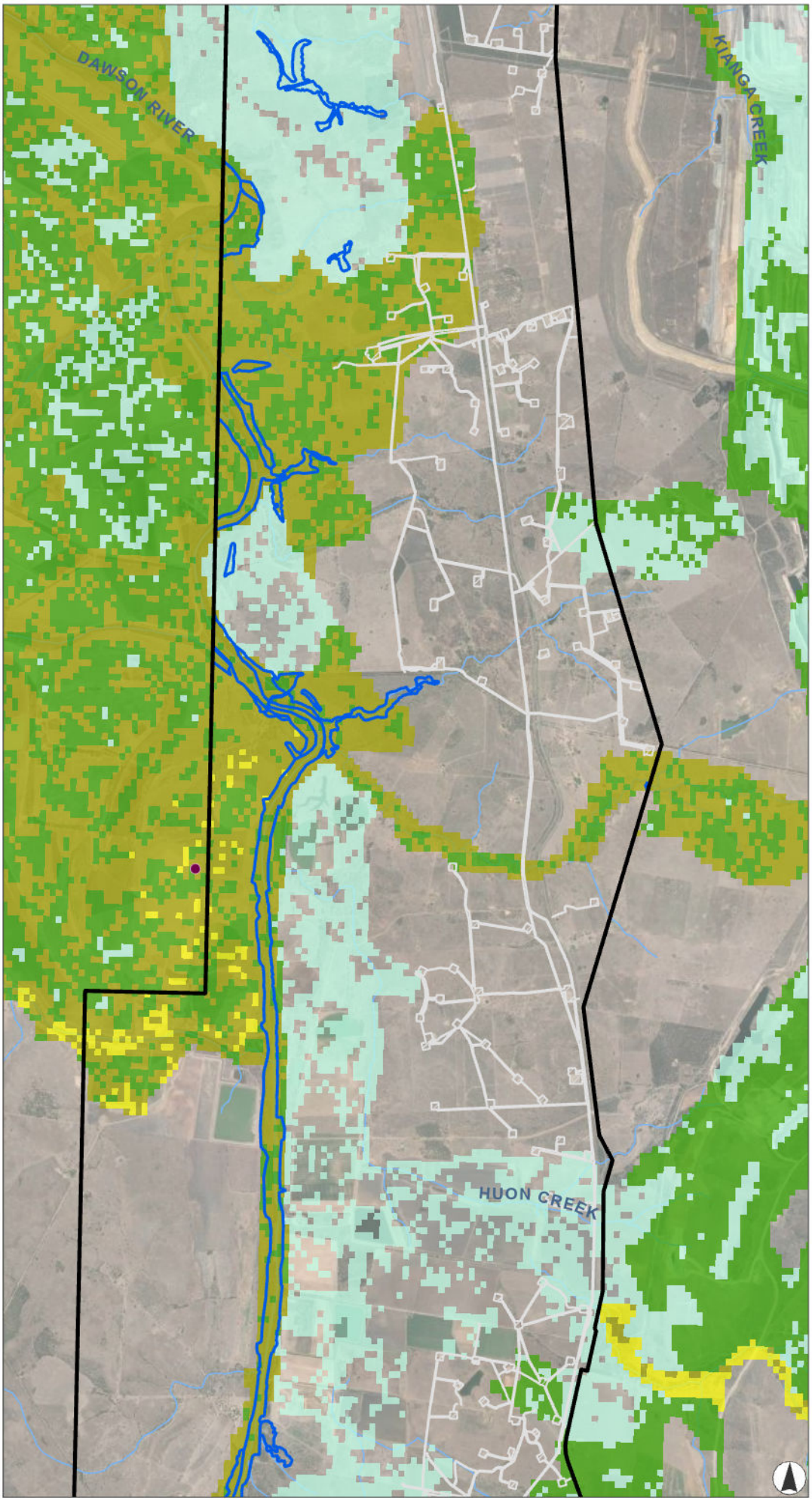

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FIGURE 9.19B

Greater glider (southern and central) *(Petauroides volans)* Habitat with DES Habitat Model

Legend

- ALA Records of Greater glider (southern and central)
- Watercourse
- Project Area
- Existing Westside infrastructure

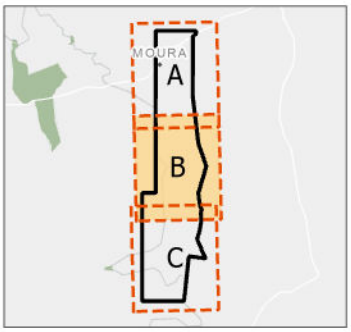
Greater glider (southern and central) Habitat

- Denning

DES (2022) Habitat Suitability Model

Petauroides volans - Likelihood Area Comprises Suitable Habitat (%)

- < 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100



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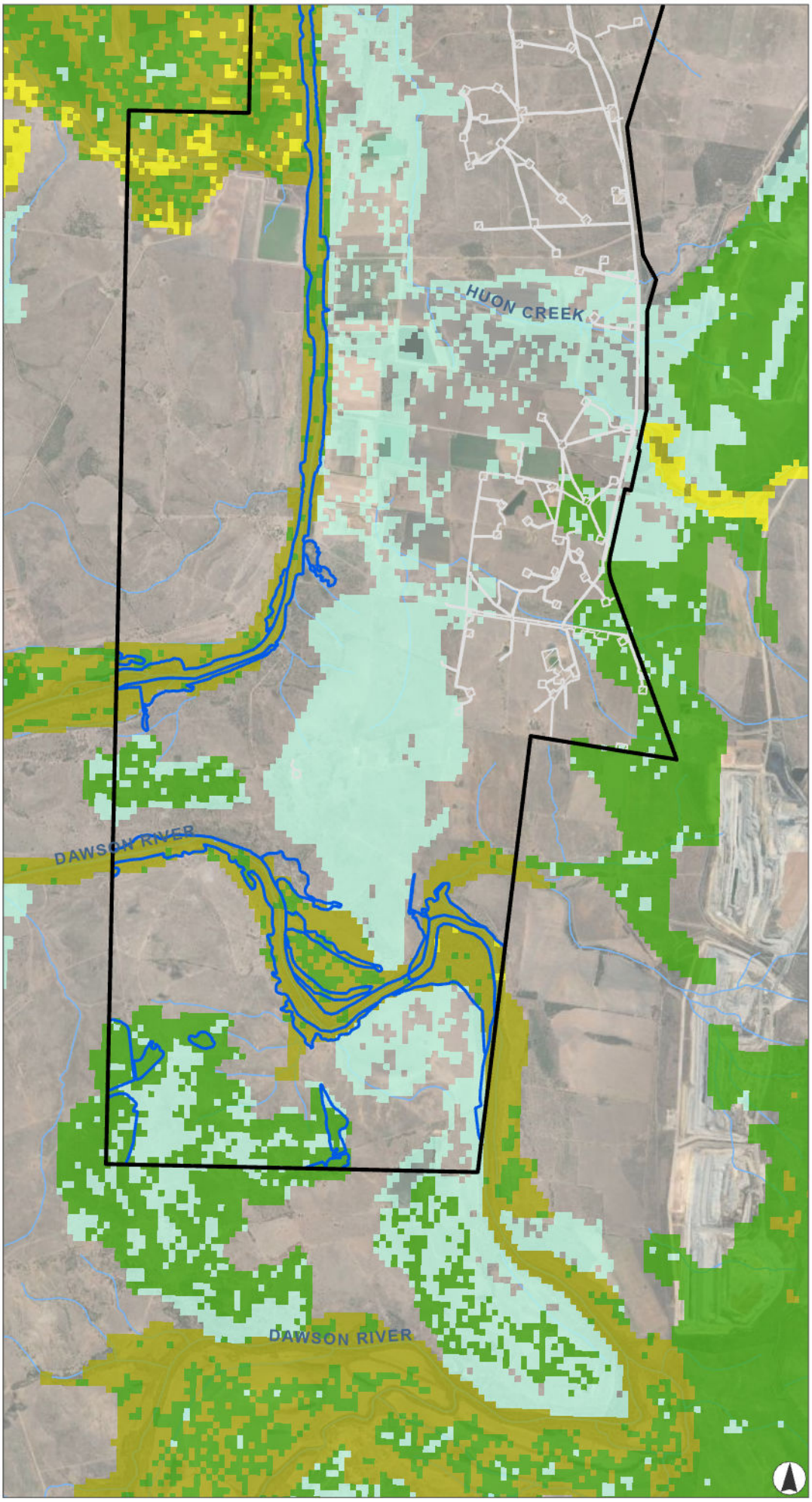


FIGURE 9.19C

Greater glider (southern and central) *(Petauroides volans)* Habitat with DES Habitat Model

Legend

- ALA Records of Greater glider (southern and central)
- Watercourse
- Project Area
- Existing Westside infrastructure

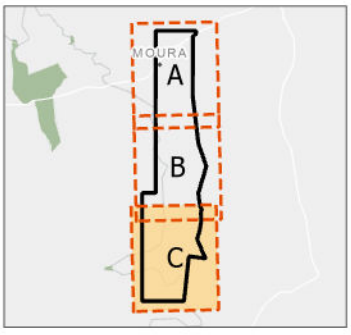
Greater glider (southern and central) Habitat

- Denning

DES (2022) Habitat Suitability Model

Petauroides volans - Likelihood Area Comprises Suitable Habitat (%)

- < 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100



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9.15 Yellow-bellied glider (south-eastern) (*Petaurus australis australis*)

9.15.1 Status under the EPBC Act

The yellow-bellied glider (south-eastern) is listed as Vulnerable under the EPBC Act.

9.15.2 Distribution and Habitat Requirements

The distribution of the yellow-bellied glider (south-eastern) coincides with the Gondwana Rainforests of Australia World Heritage Area, hence, is patchily distributed from south-eastern QLD to far south-eastern South Australia. It is found at altitudes ranging from 0 to 1400 m ASL, with the species predominately occurring in forests along the extent of the NSW east coast (Department of Agriculture Water and the Environment, 2022a). Most of the QLD distribution is coastal, along the east coast from north of Mackay to the NSW-QLD border, with subpopulations also occurring within the Blackdown and Carnarvon Ranges of central QLD. Despite a seemingly extensive distribution, it is highly disjunct due to a combination of biogeographic processes and land clearing. Their specific habitat requirements can also lead to a disjunct distribution even within areas of continuous forest (Department of Agriculture Water and the Environment, 2022a).

The yellow-bellied glider (south-eastern) occurs in eucalypt-dominated woodlands and forests, including both wet and dry sclerophyll forests (Department of Agriculture Water and the Environment, 2022a). They show a preference for large patches of mature old growth forest that provide suitable trees for foraging and shelter. There is clear preference for forests with a high proportion of winter-flowering and smooth-barked eucalypts due to the foraging resources they provide (Department of Agriculture Water and the Environment, 2022a). Yellow-bellied gliders (south-eastern) also require habitat with floristic diversity for year-round food supplies (e.g. the presence of sap feed trees) and are unlikely to persist in forests dominated by only one or two tree species. Many tree species are found in the subspecies' habitat, with some used for sap feeding. Trees known to be used for sap-feeding as per the species' Conservation Advice (Department of Agriculture Water and the Environment, 2022a) include, but are not limited to, *Eucalyptus tereticornis*, *E. crebra* and *E. moluccana*. Abundance of the species is highly dependent on habitat suitability, which is dependent on floristics and forest age.

This species has low dispersal capabilities and shelter in live tree hollows usually more than one meter in diameter (Department of Agriculture Water and the Environment, 2022a). Small social groups occupy large and exclusive home ranges at low densities (groups of 2 – 6 individuals within a home range of approximately 50–65 ha) due to the wide dispersal of trees used as foraging substrates. Hence, the protection of large areas of forest is required to maintain viable subpopulations. They also have a slow generation time of four to five years (Department of Agriculture Water and the Environment, 2022a).

Yellow-bellied glider (south-eastern) habitat suitability is based on the availability of the total set of attributes (i.e. presence of feed and shelter trees, connectivity) required by the subspecies to meet its' survival and feeding requirements. In consideration of this, yellow-bellied glider (south-eastern) habitat will often include:

- Mature forest, with live-hollow bearing trees for denning, preferably winter-flowering and smooth barked eucalypt.
- Sap feed trees with floristic diversity.
- Access to forest corridors to facilitate movement to habitat resources over time and space.

Although the yellow-bellied glider (south-eastern) is considered a gliding marsupial like the greater glider, guidance outlined in the *Guide to greater glider habitat in Queensland* (Eyre et. al 2022) is not applicable to this species. The guideline states that information outlined is specific to species within the Petauroides genus of the Pseudocheiridae family. The yellow-bellied glider (south-eastern) is from the genus Petaurus within the Petauridae family.

While some broad similarities occur between the habitat preferences of the yellow-bellied glider (south-eastern) and the greater glider, foraging requirements are notably different as the greater glider is primarily folivorous, while the yellow-bellied glider (south-eastern) is a sap-feeder. As described above, the subspecies relies on a finite list of suitable sap feed trees and as a result of their large home ranges, minimum patch size thresholds are required for habitat to be considered suitable.

9.15.3 Threats

As outlined in the subspecies' Conservation Advice (Department of Agriculture Water and the Environment, 2022a), key threats to the yellow-bellied glider (south-eastern) are clearing of habitat, fragmentation and timber harvesting, fire disturbance, invasive species predation, mortality by barbed wire fencing and habitat degradation.

The subspecies is particularly sensitive to habitat fragmentation, primarily as a result of extensive land clearing for agriculture and development throughout the species' range. Yellow-bellied gliders (south-eastern) are vulnerable to fragmentation impacts due to their large, exclusive home ranges. They require large areas of forest for habitat and have an inability to cross cleared areas of land due to restrictions of gliding distances.

9.15.4 Occurrence and Potential Habitat

The yellow-bellied glider (south-eastern) was not recorded during the field survey program. It is conservatively considered to have a moderate likelihood of occurring within the Project Area. The Project Area occurs within the subspecies 'may occur' distribution extent as per SPRAT. An ALA record from 1929 occurs within the southern Project Area along the Dawson River, however this record is reported to have a 54 km spatial uncertainty and the region has undergone large scale land clearing since that time (Q Imagery, 2024). This record has been sourced from WildNet's (Queensland Wildlife Data) Historical Fauna Database and is considered unconfirmed, however the reported locality provided is the 'mid-lower Dawson River'. Another ALA record occurs 7 km south of the Project Area along the Dawson River (undated with 9 km spatial uncertainty). The low spatial accuracy of these records leaves some uncertainty as to their true location along the Dawson River, if in this location at all. Nonetheless, for the purposes of this assessment the species is presumed present.

Potential habitat for the yellow-bellied glider (south-eastern) within the Project Area was identified through a two-step process that first involved a review of mapped vegetation composition and structure followed by patch size (and shape / configuration, as necessary). Only patches that were 50 ha or greater were considered viable for the subspecies', noting their large home ranges, territorial nature and inability to persist in narrow linear fragments. Through this process, described further below, it was determined that potential habitat for the subspecies within the Project Area is limited to the riparian corridor along the Dawson River.

Of the 21 REs mapped within the Project Area (**Table 6.4**), 13 are eucalypt-dominated woodlands including REs 11.3.2, 11.3.3, 11.3.4, 11.3.6, 11.3.17, 11.3.25, 11.3.27f, 11.4.7, 11.4.12, 11.5.2, 11.9.2, 11.9.7 and 11.9.10. Although the REDD short description indicates RE 11.4.8 is also dominated by a eucalypt, findings from the field survey program determined that within the Project Area this community was consistently dominated by *Acacia harpophylla*. From this list of thirteen (13) REs, a further 10 were excluded because they were neither dominated by a smooth or half-bark eucalypt species or floristically diverse based on field data (REs 11.3.2, 11.3.3, 11.3.6, 11.3.17, 11.3.27f, 11.4.7, 11.4.12, 11.9.2, 11.9.7, 11.9.10). Therefore, three REs mapped within the Project Area are identified as suitable for the subspecies: RE 11.3.25, 11.3.4 and 11.5.2.

A total of 1,039.4 ha of potential yellow-bellied glider (south-eastern) habitat is mapped within the Project Area comprising vegetation in remnant condition. All habitat is conservatively considered suitable for denning, foraging and dispersal purposes. The extent of yellow-bellied glider (south-eastern) habitat within the Project Area is provided below in **Table 9.30**, and the mapped habitat is shown on **Figure 9.20**.

Table 9.30 Habitat Extent for Yellow-bellied Glider (south-eastern)

Habitat Utilisation	Habitat Definition	Extent within the Project Area (ha)
Denning, foraging and dispersal	Floristically diverse, mature eucalypt woodlands and forests dominated by smooth-barks or half-barks, comprising patches or corridors ≥50 ha, that may support (now or in the future) large hollow-bearing trees.	1,039.4
	Total	**1,039.4**

Where it has been assessed during the field survey, riparian vegetation on the Dawson River is associated with RE 11.3.25 and is dominated by *Eucalyptus tereticornis,* with the only other eucalypt present being *Corymbia tessellaris* which occurs sporadically on the upper banks. Elsewhere, the river and adjacent flats support RE 11.3.2 (*Eucalyptus populnea* woodland) as per the State RE mapping. These areas have been mapped as potential habitat as they form the riparian corridor and are considered more likely to comprise RE 11.3.25. Although *E. tereticornis* is a known sap tree species, *C. tessellaris* and *E. populnea* are not. As such, it is noted that mapped potential habitat may only be marginally suitable given the species requires a level of floristic diversity that supports a year-round food supply and is unlikely to persist in forests dominated by only one or two tree species.

Petaurus australis australis is not one of the 134 threatened and priority fauna species that has modelling available in the Potential habitat models – fauna 2022 – Queensland GIS data package (DES, 2022). However, *Petaurus australis* unnamed subsp. has been modelled and the entire Project Area is mapped as <10% suitable, with only areas in northern Queensland mapped as potentially suitable.

9.15.5 Important Populations

The Conservation Advice (Department of Agriculture Water and the Environment, 2022a) defines important populations as stronghold populations, ecologically or genetically distinct populations (e.g. those at the limits of the subspecies' range, outlying populations), research populations, and other populations where recovery actions are being implemented. However, this list of important populations is not exhaustive. In the absence of such information, all known populations should be considered important.

All known populations of this subspecies are also considered important populations including:

- Carnarvon Range (inland population).
- Blackdown Tableland (inland population).

As noted above in **Section 9.15.4**, historical records of the subspecies occur south of the Project Area, with varying levels of spatial uncertainty. The subspecies is not known from the Project Area, and therefore it is not considered to contain an important population.

9.15.6 Habitat Critical to the Survival of the Species

Habitat critical to the survival of this subspecies is defined as (Department of Agriculture Water and the Environment, 2022a):

- Large contiguous areas of floristically diverse eucalypt forest, which are dominated by winter-flowering and smooth-barked eucalypts, including mature living hollow-bearing trees and sap trees.
- Areas identified as refuges under future climate change scenarios.
- Short or long-term post-fire refuges (i.e. unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonise burnt areas.
- Habitat corridors required to facilitate dispersal of the subspecies between fragmented habitat patches and/or that enable recolonisation or movement away from threats. Yellow-bellied gliders (south-eastern) have a glide ratio (horizontal distance/height dropped) of around 2.0, and corridors spanning gaps larger than the distance gliders are likely to be able to travel should be considered critical to the survival. There is not enough evidence to define the canopy and width characteristics of appropriate corridors. In the absence of such information, a precautionary approach should be taken to maximise dispersal by considering all habitat corridors in the species' range to be habitat critical to the survival.
- Areas in which some trees have evidence of use for sap extraction by the yellow-bellied glider (south-eastern).

Habitat meeting any one of the criteria above is considered habitat critical to the survival of the yellow-bellied glider (south-eastern), irrespective of the abundance or density of the species or the perceived quality of the site. Forest areas currently unoccupied by the yellow-bellied glider (south-eastern) may still represent habitat critical to survival, if the recruitment of hollow-bearing trees in the future could allow the species to colonise these areas and ensure persistence of a population.

The habitat within the Project Area is largely fragmented, however habitat corridors to facilitate dispersal, do occur. Based on this, all mapped habitat within the Project Area is conservatively assessed as being considered habitat critical to the survival of the species.

9.15.7 Potential Project Impacts and Key Mitigation Measures

Westside have committed to no direct impacts to yellow-bellied glider (south-eastern) habitat. This currently includes all areas mapped on **Figure 9.20**, subject to detailed field scouts.

Potential indirect impacts on yellow-bellied glider (south-eastern) as a result of the Project include:

- Habitat fragmentation and edge effects.
- Weeds and pests.
- Noise and light disturbance.

General mitigation measures are outlined in **Section 8.2.1**. Mitigation measures specific to yellow-bellied glider (south-eastern) are outlined in **Section 8.2.2** and below:

- Threatened fauna individuals and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of threatened fauna habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped).
- All areas of potential habitat will be designated a high constraint area and no direct impacts as a result of the Project will be permitted.
- In the unlikely event that a yellow-bellied glider (south-eastern) is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days.
- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.
- Measures outlined in the Westside Noise Management Plan (WCL-0000-HS-PLN-009), Erosion and Sediment Control Procedure (WCL-0000-HS-PRC-029) and Weed Management Procedure (WCL-0000-HS-PRC-034) will be implemented to minimise indirect impacts to the species.

9.15.8 Significant Impact Assessment

The significant impact assessment for this species is presented in **Table 9.31** below. In summary, the assessment found that the Project is **unlikely to result in a significant impact on the yellow-bellied glider (south-eastern)**.

Table 9.31 Significant Impact Assessment – Yellow-bellied Glider (south-eastern)

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Lead to a long-term decrease in the size of an important population of a species	The yellow-bellied glider (south-eastern) was not recorded during the field surveys, however the Project Area does support some suitable habitat associated with the riparian zone of the Dawson River. All habitat patches will be avoided in design with a disturbance limit of 0.0 ha. Indirect impacts on the species as a result of the Project are expected to be limited. Habitat fragmentation would not be exacerbated as clearing will not occur within suitable habitat. Populations of pest species which may predate on the species (i.e. feral cat and red fox) are likely to be already established in the Project Area and the best practice pest management measures will be enforced as defined in the Biosecurity Management Plan (WCL-0000-HS-PLN-010-010). Construction activities and ongoing vehicle use within the Project Area may increase the ignition potential of vegetation, although bushfire attributable to the Project would be managed via the EMP. As a result of increased activity in the Project area, noise disturbance would be elevated, however all yellow-bellied glider (south-eastern) habitat would be avoided, hence disturbance would be limited to areas outside of mapped suitable habitat. Given the above, a long-term decrease in the size of a yellow-bellied glider (south-eastern) population is unlikely.	Unlikely
Reduce the area of occupancy of an important population	Project activities will be collocated with existing disturbance, and mapped habitat including eucalypt woodlands/forests will be avoided during the design of the Project, therefore it is unlikely that the Project will result in a reduction of the area of occupancy of an important population.	Unlikely
Fragment an existing important population into two or more populations	It is unlikely that the Project will result in the fragmentation of an existing important population; Project activities will be collocated with existing disturbance and mapped habitat including eucalypt woodlands/forests will be avoided during the design of the Project.	Unlikely
Adversely affect habitat critical to the survival of a species	While areas of eucalypt woodland/forest with small and large hollows are present within the Project Area, and this is considered to be critical for the survival of the species, no direct impacts will occur within mapped habitat.	Unlikely
Disrupt the breeding cycle of an important population	Breeding is reliant on hollow-bearing trees. Mapped habitat including eucalypt woodlands/forests will be avoided during the design of the Project. Habitat will be marked as a 'high constraint' area and therefore only walk-over activities will occur (surveys with no ground disturbance). This is unlikely to disrupt the breeding of yellow-bellied gliders (south-eastern).	Unlikely
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	While no direct impacts will occur to mapped habitat, the results of habitat clearance within the Project Area may indirectly impact the species, such as: the potential for increased incidence of feral cat/red fox and increased noise, light and dust. Pest species which may predate on yellow-bellied glider (south-eastern) such as red fox and feral cat, are likely established throughout the Project Area. Yellow-bellied gliders (south-eastern) are known to come to ground after they have been displaced by bushfires, which suggest that fire-predation interactions may amplify this threat to the species. Bushfire can also lead to significant population decline as a result of lethal heating or suffocation from smoke, or indirectly from loss of habitat features and resources.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
	Edge effects are not expected to be amplified significantly as the Project Area is already highly fragmented and weed species are established throughout. Light spill and increased noise are expected to be temporary and localised and increased noise and light would be separated from areas potentially occupied by yellow-bellied gliders (south-eastern) given that no construction works will occur in this habitat. The scale of indirect impact is considered to be minimal given the current condition of the Project Area and the existing threats. Nevertheless, potential impacts will be actively managed via the Project's management plans. Given that no direct impacts to habitat will occur, indirect impacts would be minor and with the implementation of the suite of mitigation measures and management plans, it is unlikely that the species would decline.	
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Yellow-bellied gliders (south-eastern) have been found in the scats of red foxes. Previously, it was thought that these predators cannot climb into the canopy where gliders are found, so it was assumed they were eating already dead animals. However, video evidence from 2017 shows that foxes can and do climb trees (Department of Agriculture Water and the Environment, 2022a), meaning that some predation on living gliders may occur. With the successful implementation of mitigation measures, the overall risk of invasive species establishment within the Project Area is unlikely to be exacerbated and an increase in predatory interactions with yellow-bellied glider (south-eastern) is likely to be negligible.	Unlikely
Introduce disease that may cause the species to decline	The species is not known to be vulnerable to disease directly. Phytophthora root fungus (*Phytophthora cinnamomi*) has the potential to indirectly impact the species via the infection of eucalyptus trees. No signs of phytophthora root fungus were observed during field surveys. The Project will implement appropriate biosecurity protocols therefore, introduction of a disease that may cause the species to decline is unlikely.	Unlikely
Interfere substantially with the recovery of the species	There is no adopted or made Recovery Plan for this species. Clearing and logging activities, current burning regimes and the impacts of climate change are a major threat to large hollow-bearing trees upon which the species relies. The Project will be designed to utilise previously disturbed areas and avoid disturbance to mapped habitat including eucalypt woodlands/forests. As such, the Project is unlikely to interfere with the recovery of the species.	Unlikely

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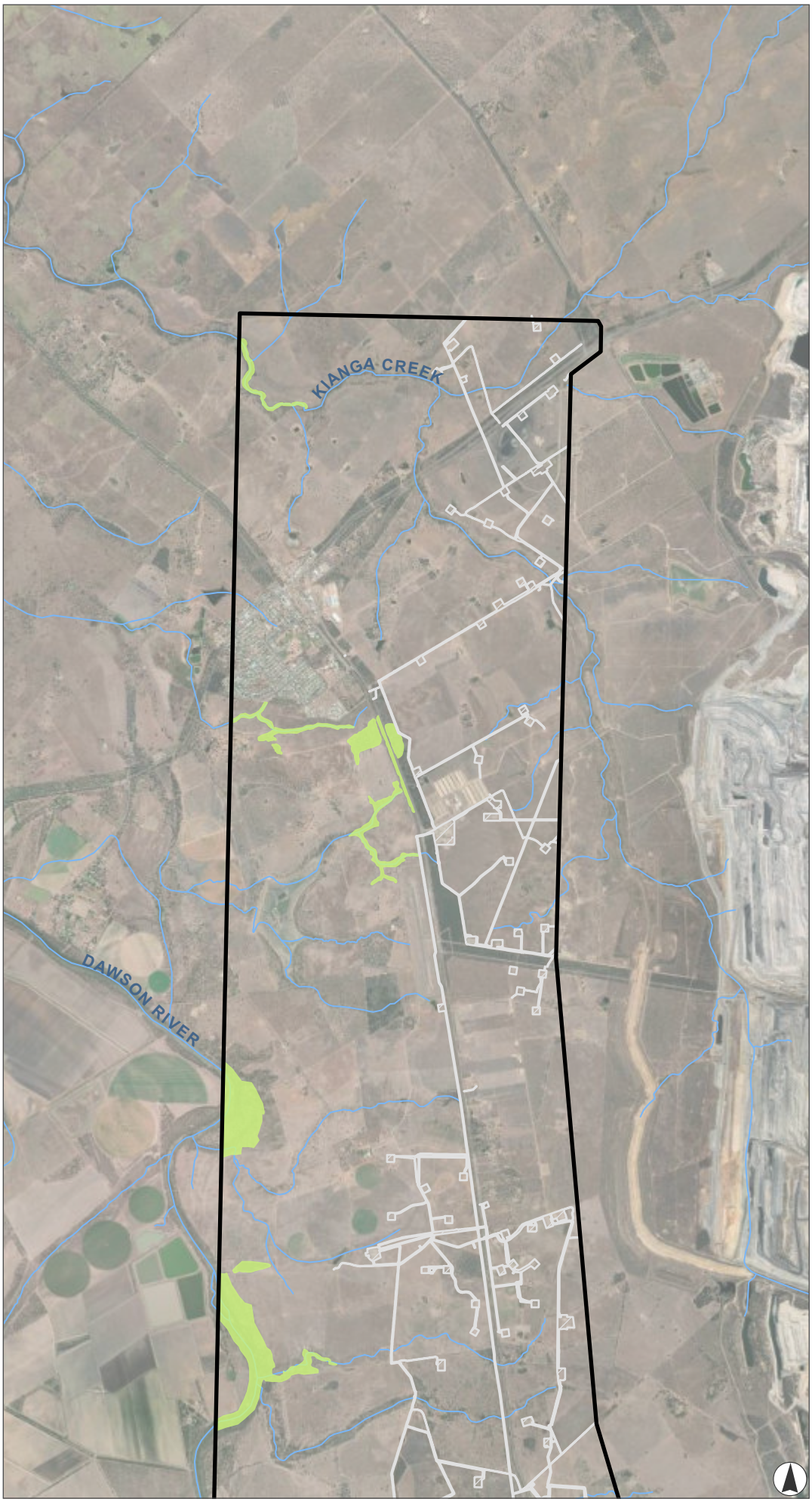


FIGURE 9.20A

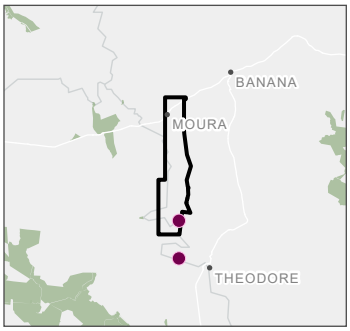
Yellow-bellied glider (south-eastern) *(Petaurus australis australis)* Habitat and Records

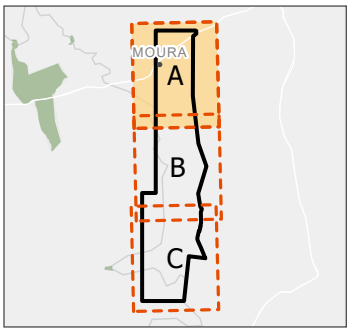
Legend

- ALA Records of Yellow-bellied glider (south-eastern)
- Watercourse
- Project Area
- Existing Westside infrastructure

Yellow-bellied glider (south-eastern) habitat mapping

- Denning, foraging and dispersal





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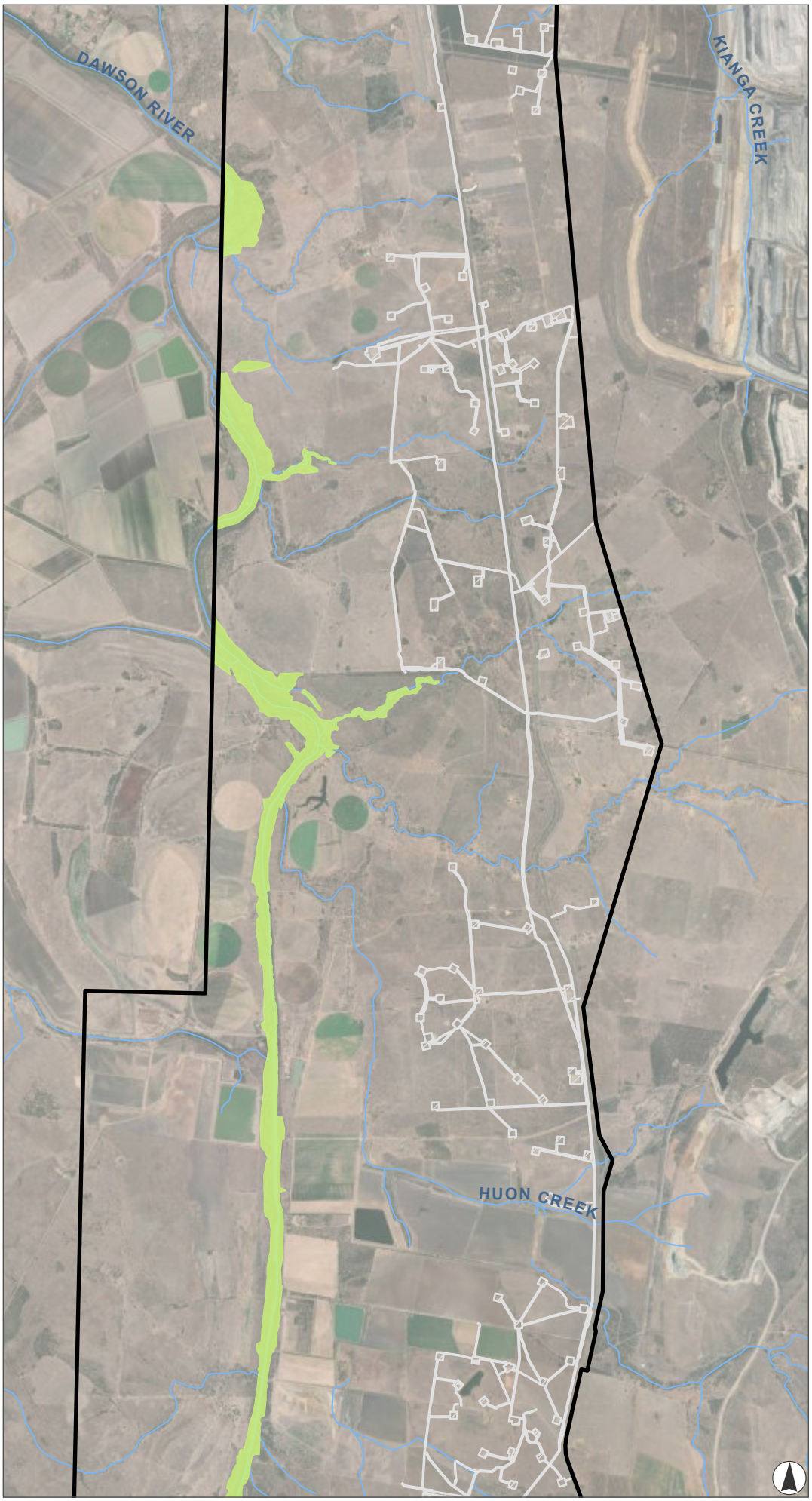


FIGURE 9.20B

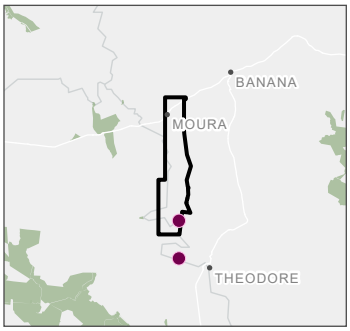
Yellow-bellied glider (south-eastern) *(Petaurus australis australis)* Habitat and Records

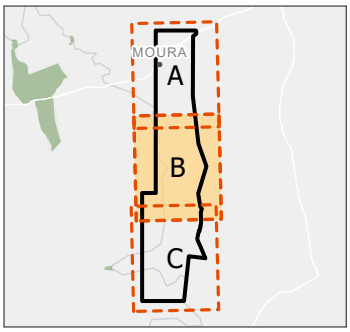
Legend

- ALA Records of Yellow-bellied glider (south-eastern)
- Watercourse
- Project Area
- Existing Westside infrastructure

Yellow-bellied glider (south-eastern) habitat mapping

- Denning, foraging and dispersal





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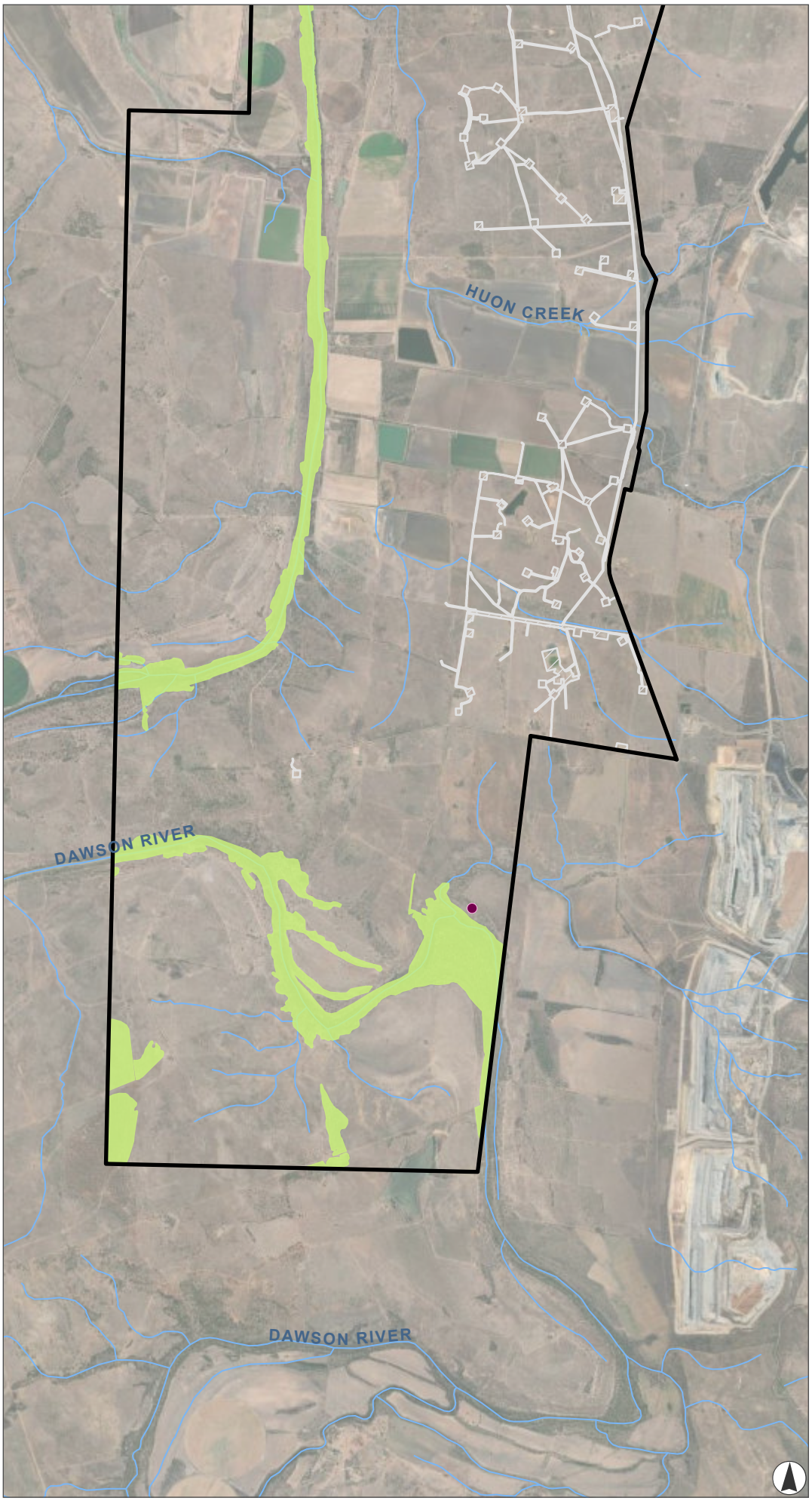


FIGURE 9.20C

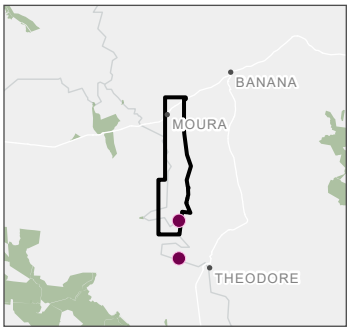
Yellow-bellied glider (south-eastern) *(Petaurus australis australis)* Habitat and Records

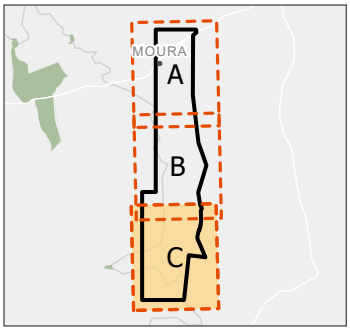
Legend

- ALA Records of Yellow-bellied glider (south-eastern)
- Watercourse
- Project Area
- Existing Westside infrastructure

Yellow-bellied glider (south-eastern) habitat mapping

- Denning, foraging and dispersal





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9.16 White-throated snapping turtle (*Elseya albagula*)

9.16.1 Status under the EPBC Act

The white-throated snapping turtle is listed as Critically Endangered under the EPBC Act.

9.16.2 Distribution and Habitat Requirements

The white-throated snapping turtle is one of the largest short-necked freshwater turtles in Australia. It is only found in the Burnett, Fitzroy, Raglan and Mary River drainages of south-east QLD. The species is recognised as a habitat specialist; within the river system, it prefers clear, flowing, well-oxygenated waters, though do occur in non-flowing waters, but typically at much reduced densities (Threatened Species Scientific Committee, 2014b).

The species has been recorded almost exclusively in reaches of streams with permanent water. It has not been recorded where there are no permanent pools during the dry season and has not been recorded inhabiting ephemeral water bodies away from main watercourses, indicating that it has a limited capacity to cross dry paddocks or follow dry streambeds for extended distances. It does not appear to permanently inhabit brackish waters, and its dispersal between rivers via the ocean appears to be limited (Hamann et al., 2007 in Department of Agriculture, Water and the Environment, 2020).

The white-throated snapping turtle exhibits a strong preference for sections of stream characterised by steep undercut banks (bank overhangs), areas of overhanging riparian vegetation providing heavy shade, and moderate to high densities of submerged boulders and/or log jams that are used for shelter. Almost all nesting occurs on alluvial sand–loam banks deposited by floodwaters, which are often reworked with each significant flooding event (Limpus, 2008 in Department of Agriculture, Water and the Environment, 2020). Nests may occur in loose or compact soils, under a closed canopy or with less than 50% canopy cover, with either a dense covering of grasses or with low or no vegetation

Populations and habitat within the species' distribution have been fragmented by the construction of multiple dam and weir structures. These structures have obstructed the upstream movement of turtles, and converted flowing stream reaches into impoundments that may have deeper, slower or more variable water levels compared to unmodified reaches.

In the Burnett River, natural flowing stream reaches lie between the upper limit of brackish water at Ben Anderson Barrage (Adopted middle thread distance (km) from the river mouth [AMTD] 25.9) and the upper end of John Goleby Weir (AMTD 333.8). This habitat has been fragmented into six sections ranging from 7 km to 47 km in length (Hamann et al., 2007 in Department of Agriculture, Water and the Environment, 2020). Adults have been observed unsuccessfully attempting to climb Ned Churchward Weir (AMTD 74.5) from the downstream side. However, as individuals can be abundant in and successfully breed from impoundment areas, and some may move over or around such infrastructure, the species' distribution is not considered severely fragmented (DotE, 2014).

9.16.3 Threats

As per the species' SPRAT profile, a Recovery Plan was considered necessary as this species is subject to a number of threats over three river catchments, including due to water infrastructure design and operation and water allocation management, which would benefit from a coordinated approach. In 2020, the Department of Agriculture, Water and the Environment published the *National Recovery Plan for the White-throated Snapping Turtle* (*Elseya albagula*).

The principal threat to the white-throated snapping turtle is the excessive (near total) loss of eggs and hatchlings at the aggregated nesting areas in the Fitzroy, Burnett and Mary Catchments. Principal predators are feral: fox, dog, pig, cat; native: varanid, water rat. Trampling of nests by cattle is also a threat.

Other threats to the white-throated snapping turtle include:

- The construction of dams and weirs.
- Stocking of fish (top end predators) into dam impoundments for recreational fishing.
- Recreational fishing.
- Dense aquatic weeds in the river and weeds on riverbanks which can alienate nesting habitat from the breeding turtles.
- Extended drought periods.

9.16.4 Occurrence and Potential Habitat

The white-throated snapping turtle was not recorded during the field survey program, however targeted surveys were not completed. It is considered to have a high likelihood of occurring within the Project Area and is presumed present for the purposes of the assessment. The Project Area occurs primarily within the species 'may occur' distribution extent however the Dawson River occurs within the species 'likely to occur' extent.

Three ALA records occur within the desktop search extent, including one from 2009 (OZCAM) which is located within the south-western Project Area along the Dawson River. Both of the other records identified are also associated with the Dawson River, dated 2002 and 2007.

As the Dawson River is the only perennial watercourse within the Project Area, it is the only watercourse that is considered suitable for the species. All other watercourses present within the Project Area are narrow, highly ephemeral and generally highly modified as a result of grazing and historical clearing.

A total of 523.9 ha of potential white-throated snapping turtle habitat is mapped within the Project Area comprising vegetation associated with the Dawson River. With the field data available, distinct areas of habitat utilisation by the species cannot be determined. As such, all areas are considered suitable for breeding and foraging purposes. The extent of white-throated snapping turtle habitat within the Project Area is provided below in **Table 9.32**, and the mapped habitat is shown on **Figure 9.21**.

It is noted that two weirs occur along the Dawson River, one to the north and one to the south, which may have impounded the habitat area contained between. Although the Moura weir (completed in 1946), located to the north-east of the Project Area along the Dawson River, has a vertical-slot fishways installed, it is not clear if turtles are able or willing to use such devices to move upstream or downstream. It is unclear if the weir south of the Project Area (the Dawson River weir completed in 1930) has any fish passage devices installed.

Installation of the weirs is likely to have severely restricted turtle dispersal (i.e. created a barrier to gene flow) and isolated the population, potentially impacting its viability with less resilience to stochastic events. Although potential habitat is largely isolated and impacted by a known threatening process, it is noted that the species can be abundant in and successfully breed from impoundment areas. As such, any population present is considered viable.

Table 9.32 Habitat Extent for White-throated Snapping Turtle

Habitat Utilisation	Habitat Definition	Extent within the Project Area (ha)
Breeding and foraging	Permanent waters of rivers and streams with deep pools that may be permanently or periodically inter-connected by shallow riffles.	523.9
	Total	**523.9**

9.16.5 Important Populations

As this species is listed as Critically Endangered under the EPBC Act, 'important populations' do not apply. There are numerous areas within each catchment where the species is abundant. However, as described in the species' Recovery Plan, all areas with high abundance/densities represent important populations, as threats impacting them could result in high losses. These populations should therefore be given particular attention when assessing threats to the species. Any area of high quality habitat with the potential to support high numbers of the species should also be surveyed when assessing threats to populations in the area.

9.16.6 Habitat Critical to the Survival of the Species

The *National Recovery Plan for the White-throated Snapping Turtle* (Department of Agriculture, Water and the Environment, 2020) notes that habitat critical to the survival of the species is defined as:

- Parts of riverine systems with permanent water, including pools, within the species' distribution that contain shelter and refuges (e.g. bank overhangs, overhanging riparian vegetation, macrophyte beds, moderate to high densities of submerged boulders and/or log jams).
- All currently known and new aggregated nesting sites (all nesting sites should be considered to be part of an aggregation unless it can be demonstrated otherwise).

While detailed field validation has not been undertaken throughout the Dawson River to determine the presence of permanent water and shelter vegetation, it is conservatively assumed that all mapped habitat within the Project Area meets the definition for habitat critical to the survival of the species.

9.16.7 Potential Project Impacts and Key Mitigation Measures

Westside have committed to no direct impacts to white-throated snapping turtle habitat (directional drilling only). This currently includes all areas mapped on **Figure 9.21**.

Potential indirect impacts on white-throated snapping turtle as a result of the Project include:

- Weeds and pests.
- Erosion, sedimentation, contamination and reduced water quality.

The above indirect impacts are associated with standard drilling and construction methodologies that may occur in areas proximal to suitable habitat. The risk of indirect impacts on the species and its habitat as a result of the use of HDD are considered very low. As described in **Section 2.1.2**, this method is widely used primarily because of the environmental benefits associated with it (when compared to traditional methods).

Use of HDD will be strictly planned and controlled to ensure no unintended impacts on MNES, such as the compromising of groundwater, surface water or landform stability and integrity. Where direction drilling is planned to avoid a watercourse and the associated riparian vegetation, the drilling launch and receipt points (and associated area of any land disturbance including clearing) will occur outside the feature's RPZ. The level of protection afforded is dependent on the stream order:

- RPZ includes 10 m from the defining bank of a stream order 1 or 2 watercourse.
- RPZ includes 25 m from the defining bank of a stream order 3 or 4 watercourse.
- RPZ includes 50 m from the defining bank of a stream order 5 or higher watercourse.

General mitigation measures are outlined in **Section 8.2.1**. Mitigation measures specific to white-throated snapping turtle are outlined in **Section 8.2.2** and below:

- Threatened fauna individuals and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of threatened fauna habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped).
- All areas of potential habitat will be designated a high constraint area and no direct impacts as a result of the Project will be permitted.
- In the unlikely event that a white-throated snapping turtle is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days.
- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.

- Measures outlined in the Westside Noise Management Plan (WCL-0000-HS-PLN-009), Erosion and Sediment Control Procedure (WCL-0000-HS-PRC-029) and Weed Management Procedure (WCL-0000-HS-PRC-034) will be implemented to minimise indirect impacts to the species.

- Project activities that utilise chemicals, fuels and other pollutants will be carefully planned for and follow strict industry-standard protocols. Specific consideration will be given to the location of sensitive environmental values present in the vicinity, including threatened turtle habitat, and the potential for contamination. Contingencies will be in place to ensure any accidental release or spill is immediately detected and managed, with corrective actions taken immediately. Measures relating to chemicals, fuels and other pollutants outlined in the EMP will be implemented to ensure potential indirect impacts on the species and its habitat are managed effectively.

9.16.8 Significant Impact Assessment

The significant impact assessment for this species is presented in **Table 9.33** below. In summary, the assessment found that the Project is **unlikely to result in a significant impact on the white-throated snapping turtle**.

Table 9.33 Significant Impact Assessment – White-throated snapping turtle

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Lead to a long-term decrease in the size of a population	No direct impacts on suitable habitat will be permitted at any time (maximum disturbance limit of 0.0 ha). To maximise the avoidance of potential habitat for the species, Westside have committed to no clearing within the Dawson River corridor and it's associated RPZ. The risk of indirect impacts on the species as a result of the Project are considered very low. Any use of HDD under the Dawson River will be strictly planned and controlled to ensure no unintended impacts on MNES including compromising groundwater, surface water or landform stability and integrity. Directional drilling, should it be required, will occur completely underneath potential habitat and will not have any effect on the surface above. The drilling launch and receipt points will occur within low constraint areas, outside the Dawson River RPZ. The potential for indirect impacts such as a reduced water quality, erosion and sedimentation and an increase in weeds and pests, is considered to be low and will be actively managed via Project management plans such as the Erosion and Sediment Control Procedure (WCL-0000-HS-PRC-029), Weed Management Procedure (WCL-0000-HS-PRC-034) and EMP. Project activities that utilise chemicals, fuels and other pollutants will be carefully planned for and follow strict industry-standard protocols. Specific consideration will be given to the location of sensitive environmental values present in the vicinity, including threatened turtle habitat, and the potential for contamination. Contingencies will be in place to ensure any accidental release or spill is immediately detected and managed, with corrective actions taken immediately. Therefore, a long-term decrease in the size of a population is unlikely.	Unlikely
Reduce the area of occupancy of the species	Westside have committed to no clearing within the Dawson River and within 50 m of the Dawson River where floodplain woody vegetation is present. Therefore, the Project is unlikely to reduce the area of occupancy for the species.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Fragment an existing population into two or more populations	Westside have committed to no clearing within the Dawson River and within 50 m of the Dawson River where floodplain woody vegetation is present. No barriers to turtle movement will occur as a result of the Project, and no changes to surface water quality or surface water levels are expected. Therefore, the Project will not fragment an existing population.	Unlikely
Adversely affect habitat critical to the survival of a species	While the habitat within the Project Area is considered to be critical to the survival of the species, only directional drilling will occur under the Dawson River with no vegetation clearing to occur within the Dawson River and within 50 m of the Dawson River where floodplain woody vegetation is present. Directional drilling, should it be required, will occur completely underneath potential habitat and will not have any effect on the surface above. The drilling launch and receipt points will occur within adjacent low constraint areas. No direct impacts on suitable habitat will be permitted (maximum disturbance limit of 0.0 ha). The potential for indirect impacts such as a reduced water quality, erosion, sedimentation, contamination and an increase in weeds and pests, is considered to be low and will be actively managed via Project management plans such as the Erosion and Sediment Control Procedure (WCL-0000-HS-PRC-029), Weed Management Procedure (WCL-0000-HS-PRC-034) and EMP. Project activities that utilise chemicals, fuels and other pollutants will be carefully planned for and follow strict industry-standard protocols. Specific consideration will be given to the location of sensitive environmental values present in the vicinity, including threatened turtle habitat, and the potential for contamination. Contingencies will be in place to ensure any accidental release or spill is immediately detected and managed, with corrective actions taken immediately. As such, the Project will not adversely affect habitat critical to the survival of the species.	Unlikely
Disrupt the breeding cycle of a population	All suitable habitat along the Dawson River, including the banks, is marked as a 'high constraint area' where only incidental walk-over activities are permitted (surveys with no ground disturbance). Given the brownfield nature of the wider Project Area, the Project is considered highly unlikely to introduce or increase the presence of exotic predators that may prey upon turtle eggs. The Project is unlikely to impact the breeding cycle of the white-throated snapping turtle.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	While no direct impacts will occur to mapped habitat, the results of habitat clearance within the Project Area may indirectly impact the species, such as: potential for greater incursion of invasive predators such as the red fox and feral cat. Pest species which may predate on the species are likely already well established within the Project Area. Edge effects are not expected to be amplified significantly and light spill and increased noise are expected to be temporary and localised. The scale of indirect impact is considered to be minimal in the context of available suitable habitat within the Project Area and adjacent habitat. Potential impacts will be actively managed via the Project's management plans.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Predation of eggs and hatchlings by fox, feral cat, dogs and feral pigs have been identified as a threat to the white-throated snapping turtle. The Project Area is already severely fragmented with existing conduits for movement, and therefore it is considered unlikely that clearing required for construction of the Project will significantly exacerbate the movement of exotic predators. Additionally, dense aquatic weeds in the river and weeds on riverbanks can alienate nesting habitat from the breeding turtles. The Project will employ best practice control methods for weeds and pests and is unlikely to introduce or exacerbate weeds or pests beyond existing levels.	Unlikely
Introduce disease that may cause the species to decline, or	Disease has not been listed as a threat to this species. However, weed and pest management for the Project will ensure best practice site hygiene measures.	Unlikely
Interfere with the recovery of the species.	A *National Recovery Plan for the White-throated Snapping Turtle* was prepared in 2020 (Department of Agriculture, Water and the Environment, 2020), and lists the following objectives: • ensure a self-sustaining healthy population structure in all catchments in which the white-throated snapping turtle occurs • enhance the condition of habitat across the white-throated snapping turtle's range to maximise survival and reproductive success. The Project is unlikely to interfere with the recovery of the species.	Unlikely

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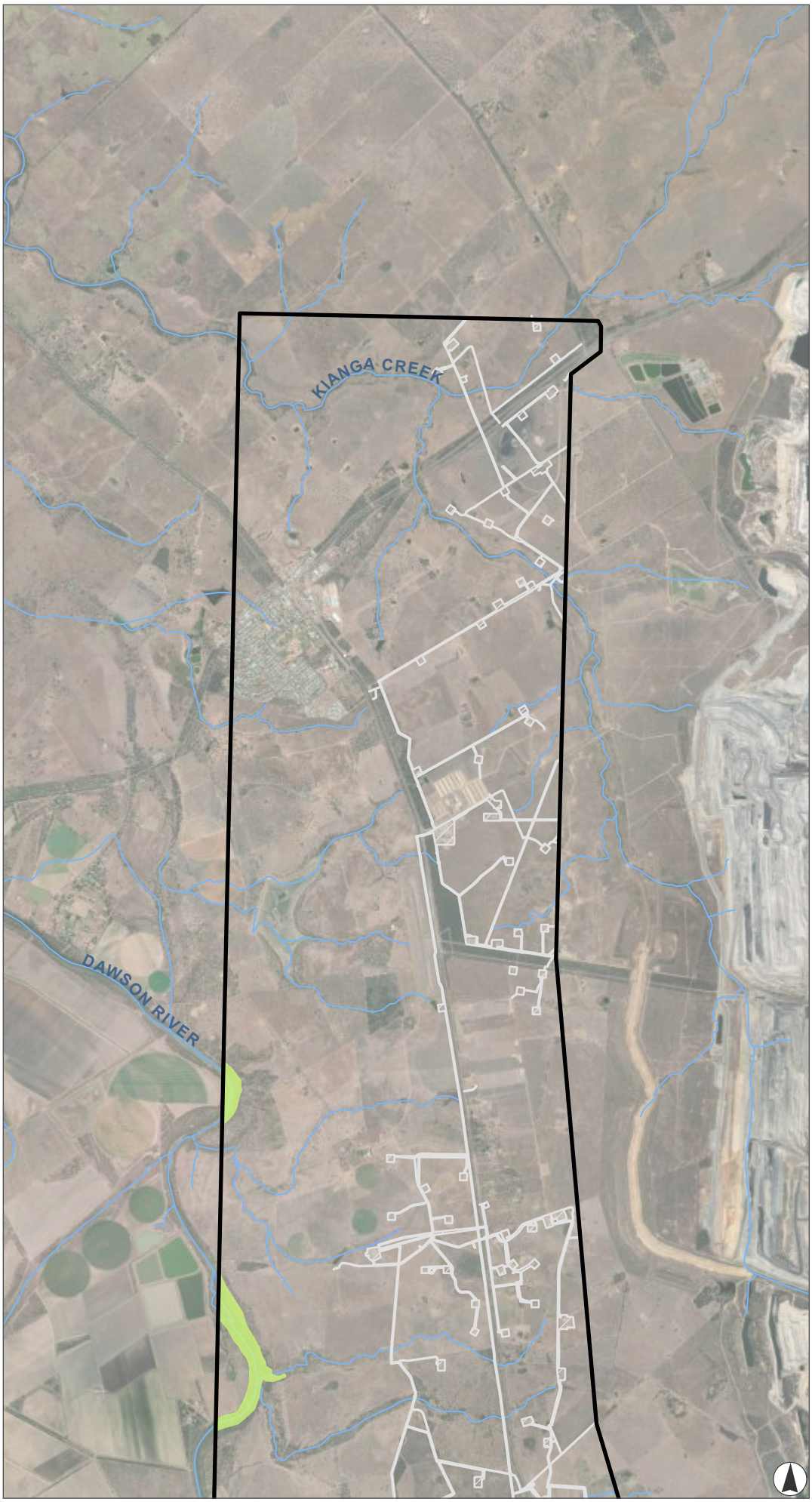
FIGURE 9.21A

White-throated snapping turtle *(Elseya albagula)* Habitat and Records

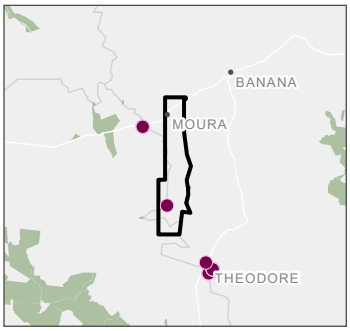


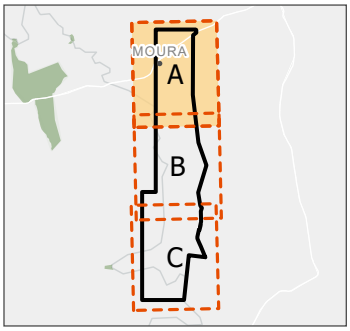
Legend

- ALA Records of White-throated Snapping Turtle
- Watercourse
- Project Area
- Existing Westside infrastructure

White-throated snapping turtle Habitat

- Breeding, foraging and dispersal





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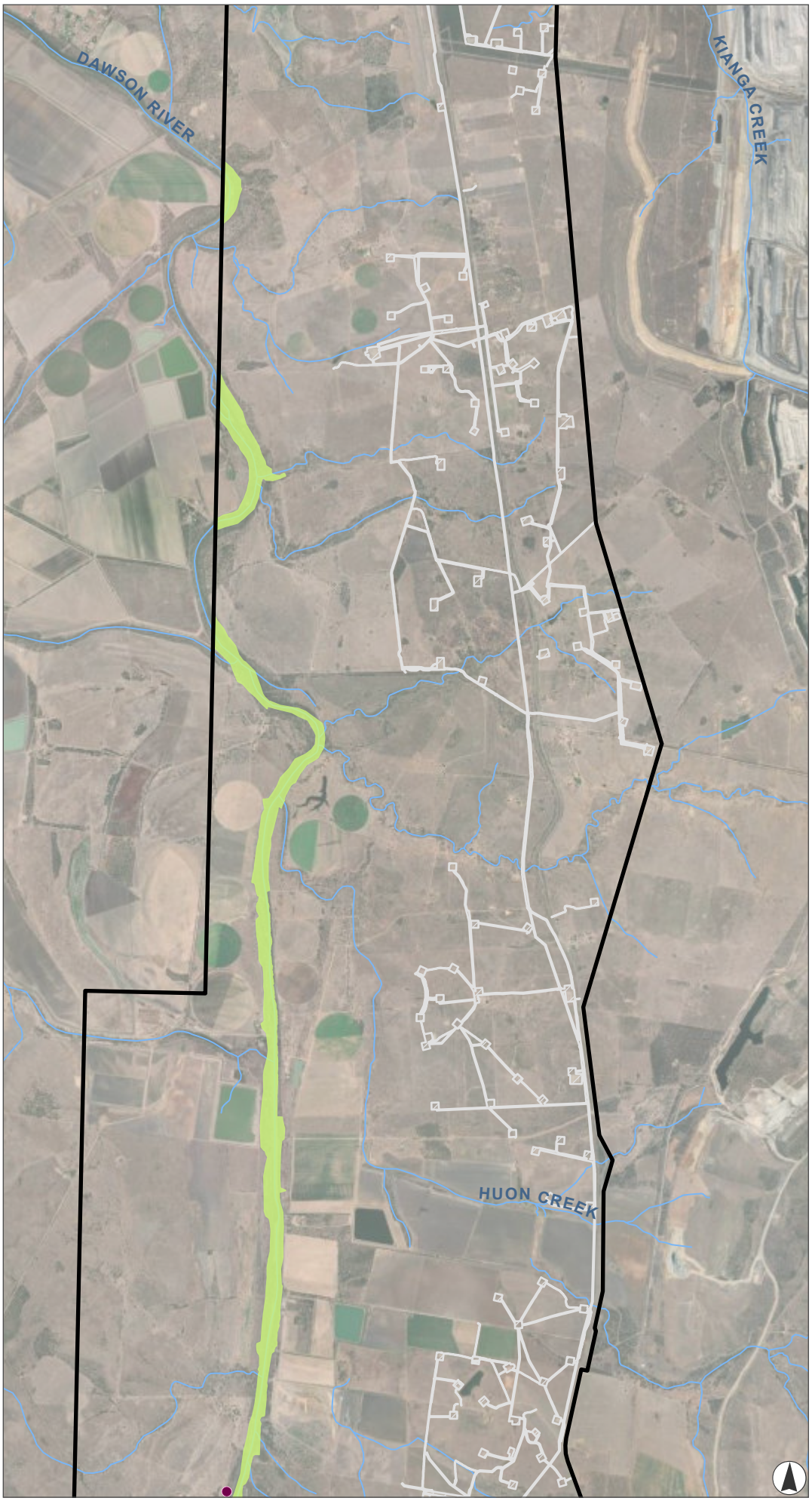


FIGURE 9.21B

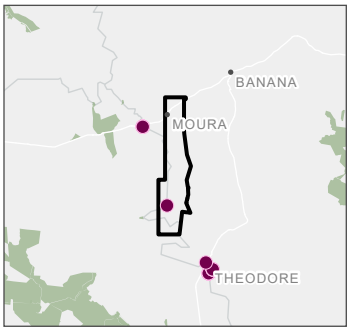
White-throated snapping turtle *(Elseya albagula)* Habitat and Records

Legend

- ALA Records of White-throated Snapping Turtle
- Watercourse
- Project Area
- Existing Westside infrastructure

White-throated snapping turtle Habitat

- Breeding, foraging and dispersal



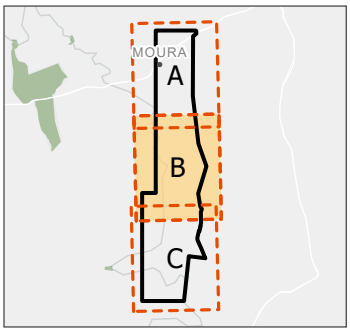


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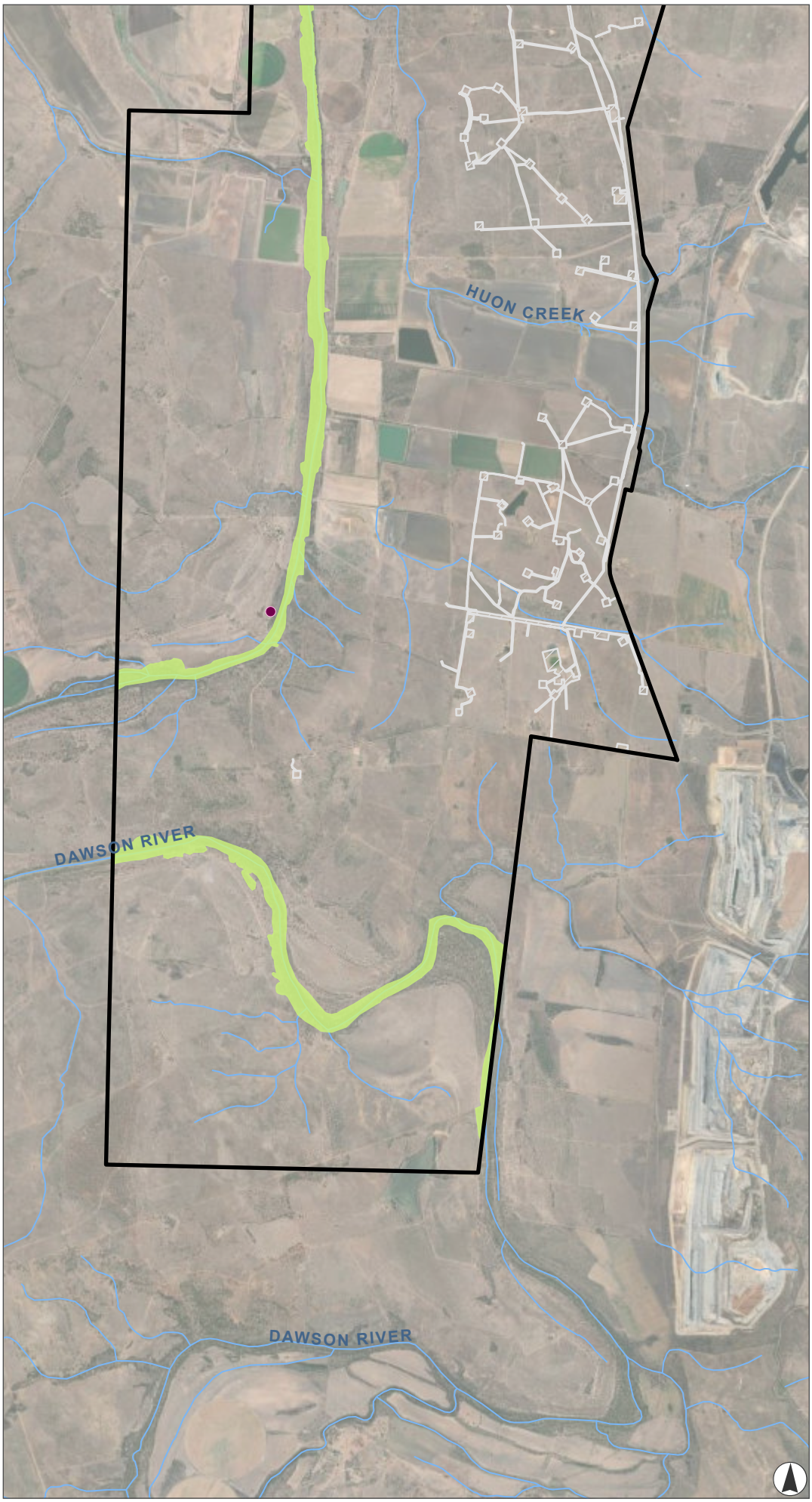
FIGURE 9.21C

White-throated snapping turtle *(Elseya albagula)* Habitat and Records

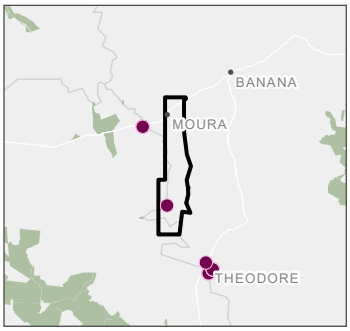


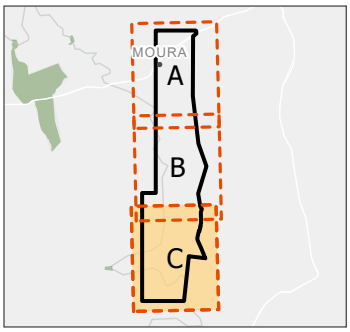
Legend

- ALA Records of White-throated Snapping Turtle
- Watercourse
- Project Area
- Existing Westside infrastructure

White-throated snapping turtle Habitat

- Breeding, foraging and dispersal





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9.17 Fitzroy River turtle (*Rheodytes leukops*)

9.17.1 Status under the EPBC Act

At the time of the referral decision date (30 June 2022), the Fitzroy River turtle was listed as Vulnerable under the EPBC Act. It is recognised that the species listing was upgraded to Endangered on 4 September 2024, however the Vulnerable species criteria has been used for this assessment.

9.17.2 Distribution and Habitat Requirements

The Fitzroy River turtle is only found in the drainage system of the Fitzroy River, QLD. Known sites include Boolburra, Gainsford, Glenroy Crossing, Theodore, Baralaba, the Mackenzie River, the Connors River, Duaringa, Marlborough Creek, and Gogango (Department of the Environment, Water, 2008).

The Fitzroy River turtle is found in rivers with large deep pools with rocky, gravelly, or sandy substrates, connected by shallow riffles. Preferred areas have high water clarity and are often associated with Ribbonweed (*Vallisneria* sp.) beds. Common riparian vegetation associated with the Fitzroy River turtle includes blue gums (*Eucalyptus tereticornis*), river oaks (*Casuarina cunninghamiana*), weeping bottlebrushes (*Callistemon viminalis*) and paperbarks (*Melaleuca linariifolia*).

Turtles often associate with logs in deeper water and may sit on the downstream side or under rocks in fast flowing riffles. To be able to breathe in these fast-flowing habitats, the Fitzroy River turtle has adapted to be able to breathe bimodally, using either its lungs or its cloaca.

9.17.3 Threats

The most prominent threats to the Fitzroy River turtle include nest predation by native and introduced predators, habitat degradation through the construction and maintenance of dams and weirds, and injury to turtles attempting to cross impoundment infrastructure; and negative impacts associated with agricultural and mining practices (Department of Climate Change Energy the Environment and Water, 2024a).

9.17.4 Occurrence and Potential Habitat

The Fitzroy River turtle was not recorded during the field survey program, however targeted surveys were not completed. It is considered to have a high likelihood of occurring within the Project Area and is presumed present for the purposes of the assessment. The Project Area occurs primarily within the species 'likely to occur' distribution extent. One ALA record from 2009 occurs within the desktop search extent, associated with the Dawson River. However, due to sensitivity concerns, the coordinates of this record have been generalised by 2 km by QLD DEHP. An additional record occurs approximately 25 km south-west (dates 2000 and generalised to 2 km). It should be noted that majority of species records occur north (approximately 50 km) in association with the Fitzroy River.

Suitable habitat for the species within the Project Area is limited to the Dawson River where deep permanent pools occur, with all other watercourses very narrow and ephemeral in nature (unlikely to be suitable). All other watercourses within the Project Area are unsuitable due to their narrow and highly ephemeral nature. Although the Moura weir (completed in 1946), located to the north-east of the Project Area along the Dawson River, has a vertical-slot fishways installed, it is not clear if turtles are able or willing to use such devices to move upstream or downstream. It is also noted that another weir occurs along the Dawson River south of the Project Area (the Dawson River weir completed in 1930). Since their installation, these weirs may have limited the species' ability to disperse and exchange genetic information. It is assumed that like the white-throated snapping turtle, any population present is considered viable despite potential habitat being impounded and functionally isolated.

A total of 523.9 ha of potential Fitzroy River turtle habitat is mapped within the Project Area comprising vegetation associated with the Dawson River. With the field data available, distinct areas of habitat utilisation by the species cannot be determined. As such, all areas are considered suitable for breeding and foraging purposes. The extent of Fitzroy River turtle habitat within the Project Area is provided below in **Table 9.34**, and the mapped habitat is shown on **Figure 9.22**.

Table 9.34 Habitat Extent for Fitzroy River Turtle

Habitat Utilisation	Habitat Definition	Extent within the Project Area (ha)
Breeding and foraging	Permanent waters of rivers and streams with deep pools that may be permanently or periodically inter-connected by shallow riffles.	523.9
	Total	**523.9**

9.17.5 Important Populations

Superseded iterations of the Conservation Advice for the Fitzroy River turtle (in effect when the species was listed as Vulnerable) did not identify important populations for the species. The current Conservation Advice (Department of Climate Change Energy the Environment and Water, 2024a) states that '*all populations of the Fitzroy River turtle are important for the conservation of the species across its range, because the species is completely restricted (endemic) to the Fitzroy River catchment, Queensland*'.

For the purposes of this assessment, any subpopulation of Fitzroy River turtle that may occur within the Project Area is considered to comprise an important population.

9.17.6 Habitat Critical to the Survival of the Species

Habitat critical to the survival of the Fitzroy River turtle is defined in the species Conservation Advice (Department of Climate Change Energy the Environment and Water, 2024a) as:

- Submerged hard substrates such as logs, tree trunks, and rock within shallow aerobic margins of large, slow-flowing reaches or large, non-flowing pools that can provide permanent dry season refugia and ephemeral wetlands.
- Alternating riffle zones and deep pools that provide a well-oxygenated environment suitable for the Fitzroy River turtle, which utilises cloacal respiration and obtains parts of its diet from the aquatic invertebrates associated with riffles zones.

- Nesting banks throughout the species' range with sandy or loamy banks.
- Nesting banks that are protected from potential invasive predators.
- Funnel Creek and Connors River, as they represent the pre-development environment and remain unregulated.
- Rookwood Weir pool-riffle complex and the associated sand bars to maintain genetic diversity and long-term evolutionary development for the reintroduction of populations or recovery of the species or ecological community.

Any breeding or foraging habitat in areas where the species is known or likely to occur and any newly discovered breeding or foraging locations should be considered habitat critical to the survival. Areas that are not currently occupied by the species, but which may become suitable in the future, should also be considered habitat critical to the survival of the species.

While detailed field validation has not been undertaken throughout the Dawson River to determine its suitability for breeding and foraging, it is conservatively assumed that all mapped habitat within the Project Area meets the definition for habitat critical to the survival of the species.

9.17.7 Potential Project Impacts and Key Mitigation Measures

Westside have committed to no direct impacts to Fitzroy River turtle habitat (directional drilling only). This currently includes all areas mapped on **Figure 9.22**.

Potential indirect impacts on the Fitzroy River turtle as a result of the Project include:

- Weeds and pests.
- Erosion, sedimentation, contamination and reduced water quality.

The above indirect impacts are associated with standard drilling and construction methodologies that may occur in areas proximal to suitable habitat. The risk of indirect impacts on the species and its habitat as a result of the use of HDD are considered very low. As described in **Section 2.1.2**, this method is widely used primarily because of the environmental benefits associated with it (when compared to traditional methods).

Use of HDD will be strictly planned and controlled to ensure no unintended impacts on MNES, such as the compromising of groundwater, surface water or landform stability and integrity. Where direction drilling is planned to avoid a watercourse and the associated riparian vegetation, the drilling launch and receipt points (and associated area of any land disturbance including clearing) will occur outside the feature's RPZ. The level of protection afforded is dependent on the stream order:

- RPZ includes 10 m from the defining bank of a stream order 1 or 2 watercourse.
- RPZ includes 25 m from the defining bank of a stream order 3 or 4 watercourse.
- RPZ includes 50 m from the defining bank of a stream order 5 or higher watercourse.

General mitigation measures are outlined in **Section 8.2.1**. Mitigation measures specific to Fitzroy River turtle are outlined in **Section 8.2.2** and below:

- Threatened fauna individuals and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of threatened fauna habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped).
- All areas of potential habitat will be designated a high constraint area and no direct impacts as a result of the Project will be permitted.
- In the unlikely event that a Fitzroy River turtle is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days.
- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.
- Measures outlined in the Westside Noise Management Plan (WCL-0000-HS-PLN-009), Erosion and Sediment Control Procedure (WCL-0000-HS-PRC-029) and Weed Management Procedure (WCL-0000-HS-PRC-034) will be implemented to minimise indirect impacts to the species.
- Project activities that utilise chemicals, fuels and other pollutants will be carefully planned for and follow strict industry-standard protocols. Specific consideration will be given to the location of sensitive environmental values present in the vicinity, including threatened turtle habitat, and the potential for contamination. Contingencies will be in place to ensure any accidental release or spill is immediately detected and managed, with corrective actions taken immediately. Measures relating to chemicals, fuels and other pollutants outlined in the EMP will be implemented to ensure potential indirect impacts on the species and its habitat are managed effectively.

9.17.8 Significant Impact Assessment

The significant impact assessment for this species is presented in **Table 9.35** below. In summary, the assessment found that the Project is **unlikely to result in a significant impact on the Fitzroy River turtle**. The species listing status at the time of the Project's original referral (Vulnerable) has been considered in the below assessment, particularly as it pertains to the severity of impacts on habitat critical to the survival of the species. Broadly speaking, Critically Endangered or Endangered MNES are considered most vulnerable to exacerbation or synergistic impacts associated with threatening processes, given they are likely to comprise small populations less resilient to stochastic events. Although the listing status of Vulnerable was used, the assessment of potential impacts was informed by the latest literature on the species including the Conservation Advice, which was updated in response to the listing change in 2024.

Table 9.35 Significant Impact Assessment – Fitzroy River turtle

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Lead to a long-term decrease in the size of an important population of a species	Inline with the species recently published Conservation Advice, any subpopulation of Fitzroy River turtle that may occur within the Project Area is considered to comprise an important population. No direct impacts on suitable habitat will be permitted at any time (maximum disturbance limit of 0.0 ha). To maximise the avoidance of potential habitat for the species, Westside have committed to no clearing within the Dawson River corridor, including within the RPZ. The risk of unintentional impacts on the species are considered very low. Any use of HDD under the Dawson River will be strictly planned and controlled to ensure no unintended impacts on MNES including compromising groundwater, surface water or landform stability and integrity. Directional drilling, should it be required, will occur completely underneath potential habitat and will not have any effect on the surface above. The drilling launch and receipt points will occur within low constraint areas, outside the Dawson River RPZ. The risk of indirect impacts such as a reduced water quality, erosion and sedimentation and an increase in weeds and pests, are considered very low and will be actively managed via Project management plans such as the Erosion and Sediment Control Procedure (WCL-0000-HS-PRC-029), Weed Management Procedure (WCL-0000-HS-PRC-034) and EMP. Project activities that utilise chemicals, fuels and other pollutants will be carefully planned for and follow strict industry-standard protocols. Specific consideration will be given to the location of sensitive environmental values present in the vicinity, including threatened turtle habitat, and the potential for contamination. Contingencies will be in place to ensure any accidental release or spill is immediately detected and managed, with corrective actions taken immediately. Therefore, a long-term decrease in the size of an important population is unlikely.	Unlikely
Reduce the area of occupancy of an important population	It is acknowledged that one of the main factors in the species' uplisting from Vulnerable to Endangered in 2024 was its restricted Area of Occupancy. Westside acknowledge the sensitive nature of the species and its habitat, which is subject to a range of threatening processes, and have committed to complete avoidance of direct impacts (maximum disturbance limit of 0.0 ha). No clearing within the Dawson River and it's RPZ will be permitted. The Dawson River and associated riparian habitat is considered a high constraint area, which means that only incidental walk-over surveys with no ground-disturbance will be permitted within. As described above, any use of HDD under the Dawson River will be strictly planned and controlled to ensure no unintended impacts on MNES including compromising groundwater, surface water or landform stability and integrity. Directional drilling, should it be required, will occur completely underneath potential habitat and will not have any effect on the surface above. Erosion and sediment control devices will be implemented in accordance with IECA Best Practice Erosion and Sediment Control documents during construction to minimise the risk of potential sedimentation to sensitive receptors including areas of threatened turtle habitat. Project activities will not result in the exacerbation of recognised threats to the species including nest predation by native and introduced predators. Key management measures in place to ensure this include ongoing, routine biosecurity monitoring and feral pest control programs (described further in the Project's Biosecurity Management Plan (WCL-0000-HS-PLN-010-010)).	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
	Any subpopulation of Fitzroy River turtle that may occur within the Project Area is considered to comprise an important population. However, based on the above, the Project is unlikely to reduce the area of occupancy for an important population.	
Fragment an existing important population into two or more populations	Westside have committed to complete avoidance of direct impacts on suitable habitat for the Fitzroy River turtle (maximum disturbance limit of 0.0 ha). Westside have committed to no clearing within the Dawson River corridor, including within the RPZ. The Project does not involve the construction of any dams or weirs in potential habitat. No barriers to turtle movement will occur as a result of the Project, and no changes to surface water quality or surface water levels are expected. Therefore, the Project will not fragment an existing important population.	Unlikely
Adversely affect habitat critical to the survival of a species	Suitable habitat for the species within the Project Area is considered to meet the definition of habitat critical to the survival of the species. No direct impacts to suitable habitat will be permitted during any phase of the Project (maximum disturbance limit of 0.0 ha). Where necessary, directional drilling may be required underneath the Dawson River to connect Project infrastructure. Directional drilling, should it be required, will occur completely underneath potential habitat and will not have any material effect on the surface above. The drilling launch and receipt points will occur within adjacent low constraint areas, but outside of the Dawson River's RPZ. Erosion and sediment control devices will be implemented in accordance with IECA Best Practice Erosion and Sediment Control documents during construction to minimise the risk of potential sedimentation to sensitive receptors including areas of threatened turtle habitat. The potential for indirect impacts such as a reduced water quality, erosion, sedimentation, contamination and an increase in weeds and pests, is considered to be low and will be actively managed via Project management plans such as the Erosion and Sediment Control Procedure (WCL-0000-HS-PRC-029), Weed Management Procedure (WCL-0000-HS-PRC-034) and EMP. Project activities that utilise chemicals, fuels and other pollutants will be carefully planned for and follow strict industry-standard protocols. Specific consideration will be given to the location of sensitive environmental values present in the vicinity, including threatened turtle habitat, and the potential for contamination. Contingencies will be in place to ensure any accidental release or spill is immediately detected and managed, with corrective actions taken immediately. The Project will not adversely affect habitat critical to the survival of the species.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Disrupt the breeding cycle of an important population	Any subpopulation of Fitzroy River turtle that may occur within the Project Area is considered to comprise an important population. All suitable habitat along the Dawson River, including the banks and associated riparian vegetation, is marked as a 'high constraint area' where only incidental walk-over activities are permitted (surveys with no ground disturbance). No direct impacts to suitable habitat are permitted at any time during the Project (maximum disturbance limit of 0.0 ha). Given the brownfield nature of the wider Project Area, pest species which may predate on the species are likely already well established within the Project Area. The Project is considered highly unlikely to introduce or increase the presence of exotic predators that may prey upon turtle eggs. Nonetheless, the Project will employ several management measures to ensure risks are managed including completing ongoing, routine biosecurity monitoring and feral pest control programs (described further in the Project's Biosecurity Management Plan (WCL-0000-HS-PLN-010-010)). The Project is unlikely to impact the breeding cycle of an important population of Fitzroy River turtles.	Unlikely
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	While no direct impacts will occur to mapped habitat, the results of habitat clearance within the Project Area may indirectly impact the species, such as: potential for greater incursion of invasive predators such as the red fox and feral cat. Pest species which may predate on the species are likely already well established within the Project Area. Edge effects are not expected to be amplified significantly and light spill and increased noise are expected to be temporary and localised, particularly noting riparian habitat supported by the Dawson River will be completed avoided. The magnitude of any indirect impact is considered to be minimal in the context of available suitable habitat within the Project Area and adjacent. Nonetheless, potential indirect impacts such as a reduced water quality, erosion, sedimentation, contamination and an increase in weeds and pests will be actively managed via Project management plans such as the Erosion and Sediment Control Procedure (WCL-0000-HS-PRC-029), Weed Management Procedure (WCL-0000-HS-PRC-034) and EMP. Therefore, the Project is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Unlikely
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Predation of eggs and hatchlings by fox, feral cat, dogs and feral pigs have been identified as a key threat to the Fitzroy River turtle. The Project Area comprises predominantly cleared land that is already severely fragmented with existing conduits for movement. No direct impacts to suitable habitat are permitted at any time during the Project (maximum disturbance limit of 0.0 ha). Siting of the Project will maximise the use of disturbed areas and look to co-locate with existing infrastructure. It is therefore considered unlikely that clearing required for construction of the Project will significantly exacerbate exotic predator populations or facilitate the movement of such predators into new areas. The Project will employ best practice control methods for weeds and pests and is unlikely to introduce or exacerbate weeds or pests beyond existing levels.	Unlikely
Introduce disease that may cause the species to decline	Disease has not been listed as a threat to this species. However, weed and pest management for the Project will ensure best practice site hygiene measures.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Interfere substantially with the recovery of the species	At the time of this assessment, the SPRAT notes that 'a recovery plan is not required'. However, the following recovery actions are recommended: • Maintain nesting banks used by the turtles and protect turtle nests from predation and disturbance. • Improve recruitment of hatchlings into the population. • Maintain stream flow and connectivity of turtle populations between impoundments. • Improve water quality in the lower Fitzroy River catchment. • Boat owners should look out for turtles floating at the surface and 'go slow for those below' to give turtles time to get out of the way of oncoming boats. Based on the above recovery actions, the Project is unlikely to interfere substantially with the recovery of the species.	Unlikely

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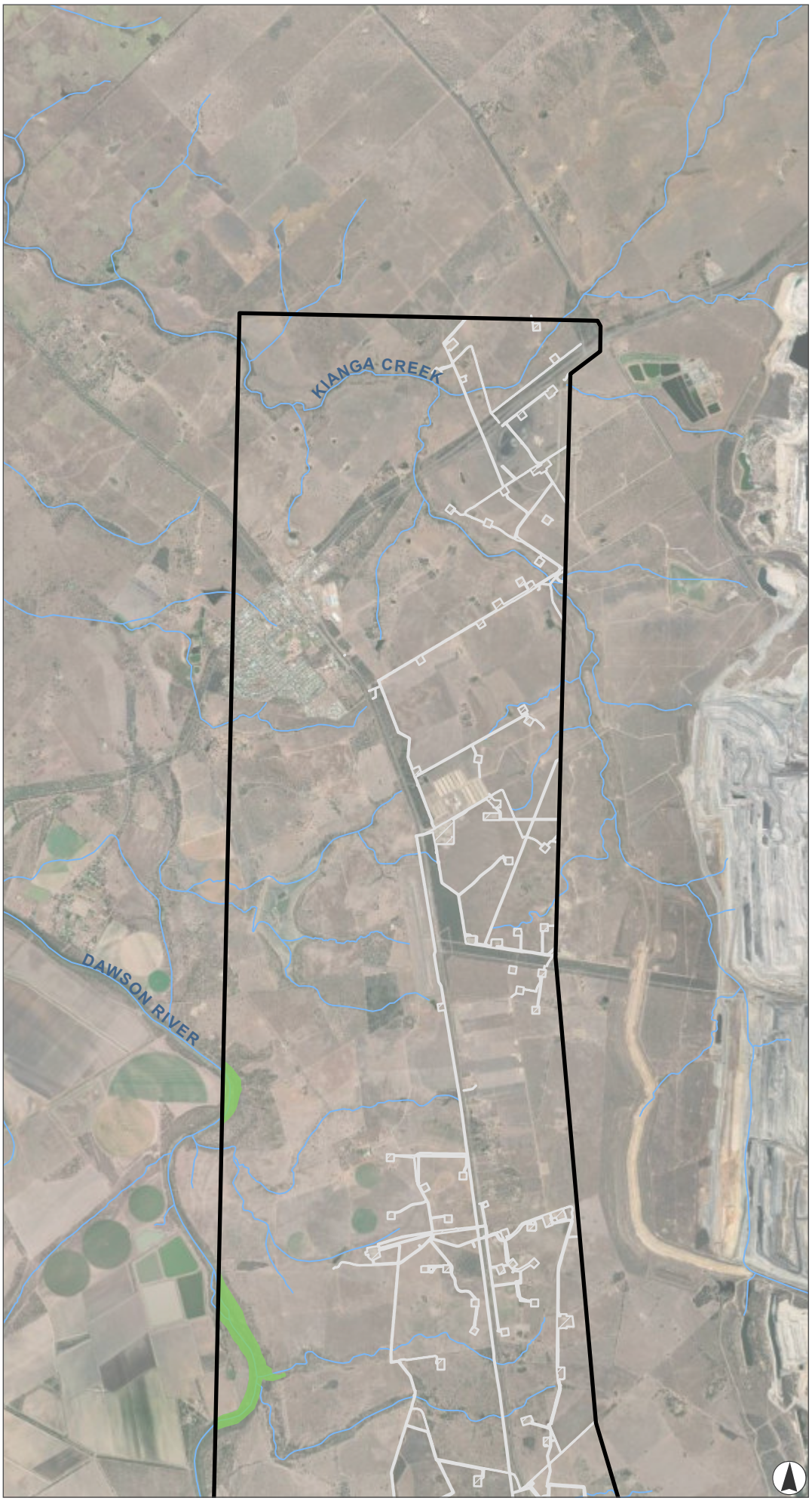


FIGURE 9.22A

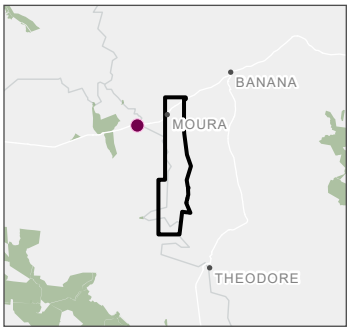
Fitzroy River turtle *(Rheodytes leukops)* Habitat and Records

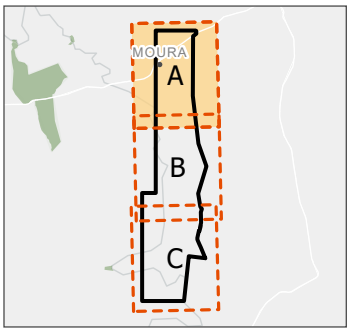
Legend

- ALA Records of Fitzroy River Turtle
- Watercourse
- Project Area
- Existing Westside infrastructure

Fitzroy River Turtle habitat mapping

- Breeding, foraging and dispersal





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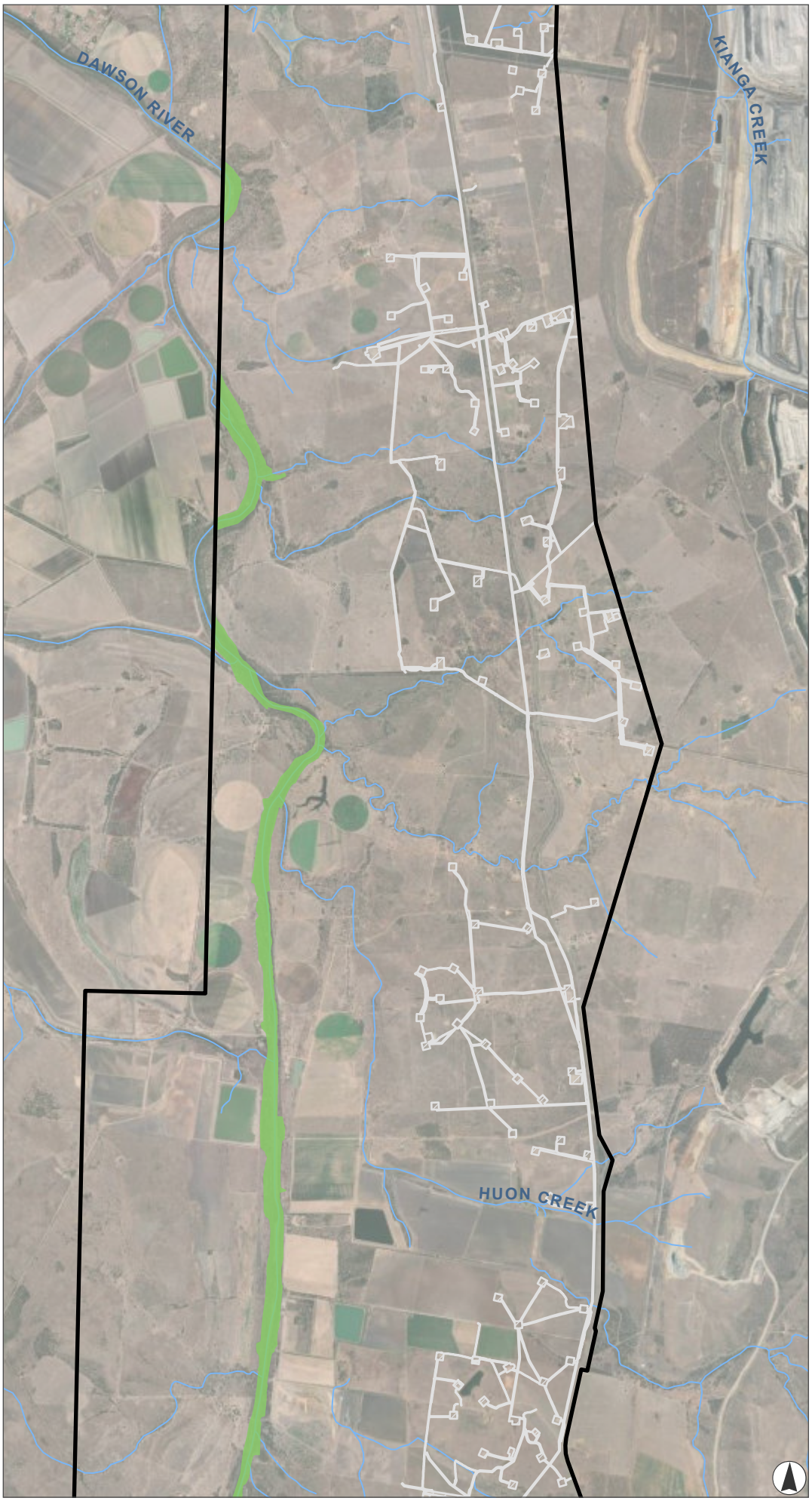


FIGURE 9.22B

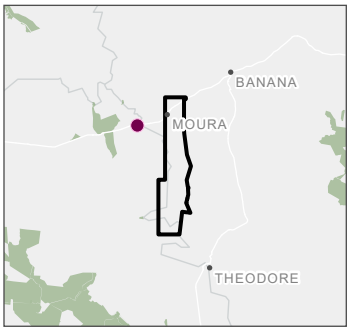
Fitzroy River turtle *(Rheodytes leukops)* Habitat and Records

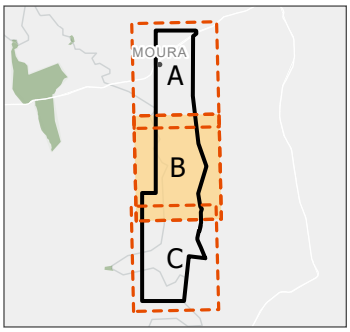
Legend

- ALA Records of Fitzroy River Turtle
- Watercourse
- Project Area
- Existing Westside infrastructure

Fitzroy River Turtle habitat mapping

- Breeding, foraging and dispersal





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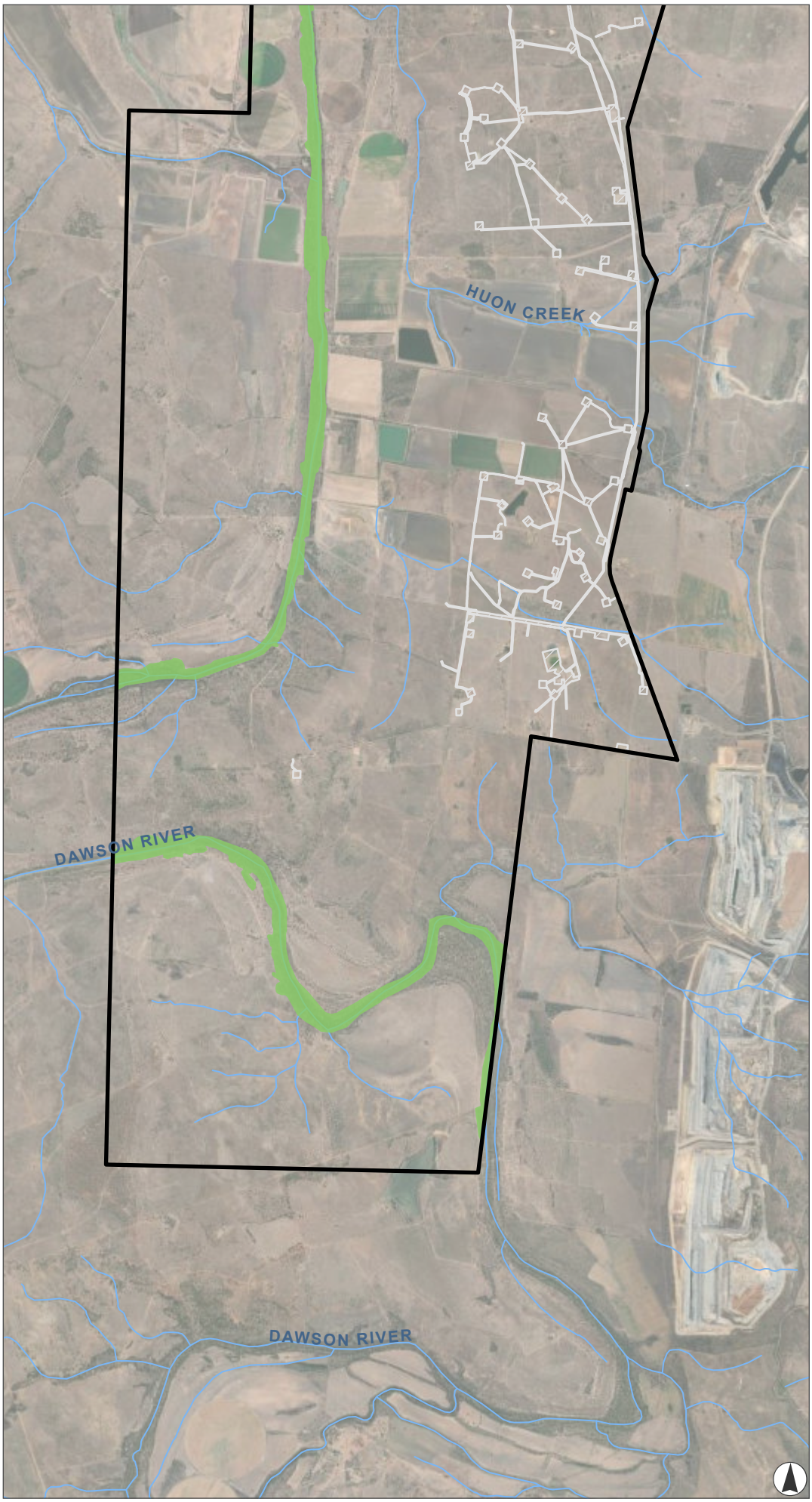


FIGURE 9.22C

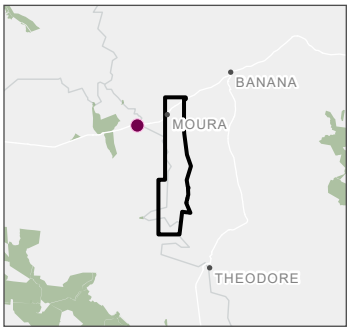
Fitzroy River turtle *(Rheodytes leukops)* Habitat and Records

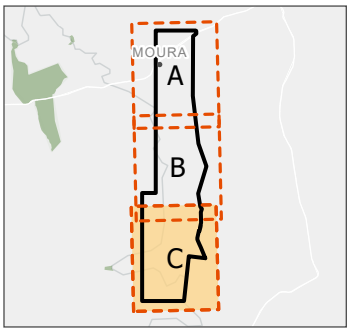
Legend

- ALA Records of Fitzroy River Turtle
- Watercourse
- Project Area
- Existing Westside infrastructure

Fitzroy River Turtle habitat mapping

- Breeding, foraging and dispersal





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9.18 Boggomoss snail (*Adclarkia dawsonensis*)

9.18.1 Status under the EPBC Act

The boggomoss snail is listed as Critically Endangered under the EPBC Act.

9.18.2 Distribution and Habitat Requirements

The boggomoss snail is found in a very restricted distribution along 90 km of the Dawson River at sites found within 2 km of the river between Mt Rose near Taroom and south of Theodore. The six currently known locations are identified at Kia Ora, Nardoo, Southend, Isla-Delusion, Gyranda and Mt Rose (Department of Environment and Heritage Protection, 2017).

The boggomoss snail is restricted to alluvial flats and riparian environments where much of the soil is well-drained brown/grey clay derived from basalt. Broad habitat types in which the species has been found include: riparian woodlands and forest; monospecific stands of Carnarvon fan palm (*Livistona nitida*); open forest fringing ephemeral wetlands on the Dawson River floodplain; and boggomosses – a series of small, raised peat bogs that form when water from aquifers of the Great Artesian Basin is pushed to the surface through mound springs (Department of Environment and Heritage Protection, 2017). Within the broad habitat types, the species has been found in five REs: 11.3.3, 11.3.4, 11.3.25, 11.3.27 and 11.3.36, all of which have a biodiversity status of 'of concern' under the VM Act.

The species' microhabitat has a critical requirement for deep, moist leaf litter and fallen timber which provide food, shelter and egg-laying sites. The microhabitat preferences are considered as follows:

- Partially buried logs in moist situations at all known sites.
- Accumulated leaf litter under QLD blue gum at all known sites.
- Accumulated litter (including fronds) at the base of Carnarvon palm in the riparian forests of the Dawson River.
- Deep accumulated leaf litter among the canes of sandpaper figs on the boggomosses of Mt Rose Station (Department of Environment and Heritage Protection, 2017).

9.18.3 Threats

The primary threat to the boggomoss snail is the reduction and degradation of its preferred habitat - riparian vegetation on alluvial flats in the Dawson River Valley, which has been largely cleared for agricultural development. Other key threats to the species include major flooding events, fire disturbance, cattle grazing, weed infestation, collection of fallen timber for firewood, and earthmoving associated with roadworks. Changes to hydrology in the local area by a structure such as a dam or weir could also lead to interruption of normal river flows and cause inundation of the species' habitat.

9.18.4 Occurrence and Potential Habitat

The boggomoss snail was not recorded during the field survey program, however targeted surveys were not completed. It has been conservatively considered to have a moderate likelihood of occurring within the Project Area. The species is known from only six discreet locations between Taroom and Theodore, connected by the Dawson River. For the purposes of this assessment the species is presumed present.

Only a portion of the far southern extent of the Project Area occurs within the species mapped 'may occur' distribution extent, which is north of the known population at the Isla-Delusion crossing. However, the Dawson River continues north and traverses the length of the western Project Area. The species is known to be highly sensitive to impacts that may result in altered hydrology. The Project Area has been subject to extensive land use change and broadscale clearing as evident on historical aerial imagery. Furthermore, two weirs occur along the Dawson River immediately north-west of the Project Area (the Moura weir, completed in 1946) and immediately south of the Project Area (the Dawson River Weir, completed in 1930). These factors are likely to have resulted in reduced or altered surface water regimes in many places, potentially rendering habitat unsuitable or marginal in places that would have otherwise been suitable. Altered surface water flows, especially along the Dawson River, are also likely to have reduced the chances of flood events and recolonisation. Other threats such as grazing and weeds are also common across the Project Area. Potential habitat for the species within the Project Area is therefore confined to areas that align with the predicted distribution of the species.

Four ALA records occur at four locations to the southeast of the Project Area near Theodore, ranging between 9 – 12 km away. Of these four records, the most recent and closest to the Project Area is dated 2009 and has a 500 m spatial uncertainty. As no survey effort specific to the species has occurred in Project Area, the precautionary principle has been applied, and the species has been presumed present in association with the Dawson River and floodplains containing woody vegetation.

A total of 159.0 ha of potential boggomoss snail habitat is mapped within the Project Area comprising woodlands on alluvial in remnant and regrowth condition analogous to REs 11.3.2, 11.3.3, 11.3.4 and 11.3.25. All habitat is conservatively considered suitable for breeding and foraging purposes. The extent of boggomoss snail habitat within the Project Area is provided below in **Table 9.36**, and the mapped habitat is shown on **Figure 9.23.**

Table 9.36 Habitat Extent for Boggomoss Snail

Habitat Utilisation	Habitat Definition	Extent within the Project Area (ha)
Breeding and foraging	Riparian woodlands and forest, monospecific stands of Carnarvon fan palm Livistona nitida, open forest fringing ephemeral wetlands on the Dawson River floodplain and artesian mound springs, that support microhabitat including partially buried logs in moist conditions and accumulated leaf litter (including palm fronds) AND occur within the species predicted distribution. Riparian/floodplain woodlands and forests must comprise a 'suitable regional ecosystem (RE)' as described on SPRAT.	159.0
	Total	**159.0**

9.18.5 Important Populations

As this species is listed as Critically Endangered under the EPBC Act, 'important populations' do not apply.

9.18.6 Habitat Critical to the Survival of the Species

The National Recovery Plan for the Boggomoss Snail (Department of Environment and Heritage Protection, 2017) notes that habitat critical to the survival of the species includes:

- the current area of occupancy
- potential suitable habitat to which the species could be dispersed to or be translocated
- newly discovered locations that extend the current area of occupancy.

Although surveys undertaken between 2009 and 2013 extended the known distribution of the boggomoss snail throughout the Dawson River region (Department of Environment and Heritage Protection, 2017), consistent methodology to formally assess the species' potential habitat has not been used. The continued existence of the species in very small suitable areas of remnant vegetation appears to indicate that its viability can be maintained in small allotments (1-3 ha). Therefore, it is conservatively assumed that all mapped habitat within the Project Area meets the definition for habitat critical to the survival of the species. This habitat is in association with the Dawson River and associated floodplains containing remnant woody vegetation.

9.18.7 Potential Project Impacts and Key Mitigation Measures

Westside have committed to no direct impacts to boggomoss snail habitat, with directional drilling proposed to occur under the Dawson River should infrastructure need to traverse the river.

Key direct threatening processes relevant to this species relate to practices in which the Project will not contribute to (e.g. no loss of habitat will occur, nor will the Project influence other threatening processes such as major flooding events, or cattle grazing impacts).

Potential indirect impacts on the boggomoss snail and its habitat as a result of the Project are likely to be very low (given the full avoidance of potential habitat), but may include habitat degradation through contamination arising from spills or accidental releases of chemicals and other pollutants, as well as an increased presence of weeds and pests in the wider Project Area.

The risk of indirect impacts on the species and its habitat as a result of the use of HDD are considered very low. As described in **Section 2.1.2**, this method is widely used primarily because of the environmental benefits associated with it (when compared to traditional methods).

Use of HDD will be strictly planned and controlled to ensure no unintended impacts on MNES, such as the compromising of groundwater, surface water or landform stability and integrity. Where direction drilling is planned to avoid a watercourse and the associated riparian vegetation, the drilling launch and receipt points (and associated area of any land disturbance including clearing) will occur outside the feature's RPZ.

The level of protection afforded is dependent on the stream order:

- RPZ includes 10 m from the defining bank of a stream order 1 or 2 watercourse.
- RPZ includes 25 m from the defining bank of a stream order 3 or 4 watercourse.
- RPZ includes 50 m from the defining bank of a stream order 5 or higher watercourse.

General mitigation measures are outlined in **Section 8.2.1**. Mitigation measures specific to boggomoss snail are outlined in **Section 8.2.2** and below:

- Threatened fauna individuals and habitat within the proposed infrastructure location will be identified and mapped by a suitably qualified ecologist during the field scouts completed as part of the Assess Project execution phase. The presence and extent of threatened fauna habitat within a minimum of 30 m of the infrastructure location should also be assessed during the field scouts. Where this cannot be completed (i.e. land access restrictions), presence will be assumed if such findings are supported by the MNES mapping (i.e. potential habitat mapped).
- Boggomoss snail habitat that is confirmed via a field scout will become a no-go constraint area, to minimise mortality risks including accidental trampling.
- All areas of potential habitat will be designated a high constraint area and no direct impacts as a result of the Project will be permitted. If deemed critical for the Project, Westside may employ directional drilling methods to construct underneath these habitat types. This will only be permitted where potential impacts are assessed by a suitably qualified ecologist including as part of the field scout and are confirmed to have a negligible impact on the habitat composition, quality and function.
- In the highly unlikely event that a boggomoss snail is killed as a result of Project activities, DCCEEW will be notified within a maximum period of 2 business days.
- All requirements within the Westside Weed Management Procedure (WCL-0000-HS-PRC-034) and Biosecurity Management Plan (WCL-0000-HS-PLN-010-010) will be implemented to minimise the introduction and spread of pest and weed species within areas of habitat.
- Measures outlined in the Westside Noise Management Plan (WCL-0000-HS-PLN-009), Erosion and Sediment Control Procedure (WCL-0000-HS-PRC-029) and Weed Management Procedure (WCL-0000-HS-PRC-034) will be implemented to minimise indirect impacts to the species.
- Project activities that utilise chemicals, fuels and other pollutants will be carefully planned for and follow strict industry-standard protocols. Specific consideration will be given to the location of sensitive environmental values present in the vicinity, including boggomoss snail habitat, and the potential for contamination. Contingencies will be in place to ensure any accidental release or spill is immediately detected and managed, with corrective actions taken immediately. Measures relating to chemicals, fuels and other pollutants outlined in the EMP will be implemented to ensure potential indirect impacts on the species and its habitat are managed effectively.

9.18.8 Significant Impact Assessment

The significant impact assessment for this species is presented in **Table 9.37** below. In summary, the assessment found that the Project is **unlikely to result in a significant impact on the boggomoss snail**.

Table 9.37 Significant Impact Assessment – Boggomoss snail

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Lead to a long-term decrease in the size of a population	The boggomoss snail is not known to occur within the Project Area. Given the broadscale nature of historical modification both within the Project Area and wider region, it is considered highly likely that the species does not occur. However, given it has not been subject to targeted surveys, it has been conservatively considered a potential occurrence. Potential habitat for the species is limited to the far southern extent of the Project Area where the Dawson River occurs, in accordance with the species' mapped distribution. Relative to the size of the Project Area, only a very small amount of potential habitat has been identified and it is considered possible that no Project activities will occur in this general area at any time. No direct impacts on suitable habitat will be permitted at any time (maximum disturbance limit of 0.0 ha). To maximise the avoidance of potential habitat for the species, Westside have committed to no clearing within the Dawson River corridor, including within the RPZ. Boggomoss snail habitat that is confirmed via a field scout will become a no-go constraint area, to minimise mortality risks including accidental trampling. The risk of indirect impacts on the species are considered very low. Any use of HDD will be strictly planned and controlled to ensure no unintended impacts on MNES will occur including compromising groundwater, surface water or landform stability and integrity. Directional drilling, should it be required, will occur completely underneath potential habitat and will not have any effect on the surface above. Potential indirect impacts associated with reduced water quality, erosion and sedimentation and an increase in weeds and pests, is considered to be low and will be actively managed via Project management plans such as the Erosion and Sediment Control Procedure (WCL-0000-HS-PRC-029), Weed Management Procedure (WCL-0000-HS-PRC-034) and EMP. Project activities that utilise chemicals, fuels and other pollutants will be carefully planned for and follow strict industry-standard protocols. Specific consideration will be given to the location of sensitive environmental values present in the vicinity, including threatened turtle habitat, and the potential for contamination. Contingencies will be in place to ensure any accidental release or spill is immediately detected and managed, with corrective actions taken immediately. Therefore, a long-term decrease in the size of a population is unlikely.	Unlikely
Reduce the area of occupancy of the species	No direct impacts on the species as a result of the Project are permitted. Westside have committed to no clearing within the Dawson River and it's associated RPZ. Directional drilling, should it be required, will occur completely underneath potential habitat and will not have any effect on the surface above. No significant changes in hydrology (surface water or groundwater) are expected to occur as a result from the Project. Boggomoss snail habitat that is confirmed via a field scout will become a no-go constraint area, to minimise mortality risks including accidental trampling. The risk of indirect impacts on the species and its habitat are very low and will be actively managed via Project management plans. As no direct impacts are proposed, the Project will not fragment a population of the snail nor reduce its area of occupancy.	Unlikely
Fragment an existing population into two or more populations		Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
Adversely affect habitat critical to the survival of a species	While the habitat identified within the Project Area is considered to be critical to the survival of the species, only directional drilling will occur under the Dawson River with no vegetation clearing to occur within the Dawson River and its RPZ. The Project will not adversely affect habitat critical to the survival of the species as no direct impacts to habitat are permissible. The risk of indirect impacts on the species are considered very low. Any use of HDD will be strictly planned and controlled to ensure no unintended impacts on MNES including Boggomoss snail habitat will occur including compromising groundwater, surface water or landform stability and integrity. Potential indirect impacts associated with reduced water quality, erosion and sedimentation and an increase in weeds and pests, is considered to be low and will be actively managed via Project management plans such as the Erosion and Sediment Control Procedure (WCL-0000-HS-PRC-029), Weed Management Procedure (WCL-0000-HS-PRC-034) and EMP. Project activities that utilise chemicals, fuels and other pollutants will be carefully planned for and follow strict industry-standard protocols. Specific consideration will be given to the location of sensitive environmental values present in the vicinity, including threatened turtle habitat, and the potential for contamination. Contingencies will be in place to ensure any accidental release or spill is immediately detected and managed, with corrective actions taken immediately. Therefore, a long-term decrease in the size of a population is unlikely.	Unlikely
Disrupt the breeding cycle of a population	All suitable habitat along the Dawson River, including the banks, is currently considered to comprise a 'high constraint area' where only walk-over activities are permitted (surveys with no ground disturbance). However, boggomoss snail habitat that is confirmed via a field scout will become a no-go constraint area, to minimise mortality risks to the species including accidental trampling. As no direct impacts on suitable habitat are permitted and indirect impacts on the species are anticipated to be very minor, the Project is unlikely to impact the breeding cycle of the boggomoss snail.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Potential habitat for the species is limited to the far southern extent of the Project Area where the Dawson River occurs, in accordance with the species' mapped distribution. Relative to the size of the Project Area, only a very small amount of potential habitat has been identified and it is considered possible that no Project activities will occur in this area at any time. Boggomoss snail habitat that is confirmed via a field scout will become a no-go constraint area, to minimise mortality risks including accidental trampling. To maximise the avoidance of potential habitat for the species, Westside have committed to no clearing within the Dawson River corridor, including within the RPZ. The risk of indirect impacts on the species are considered very low. Any use of HDD will be strictly planned and controlled to ensure no unintended impacts on MNES including Boggomoss snail habitat will occur including compromising groundwater, surface water or landform stability and integrity. No significant changes in hydrology (surface water or groundwater) are expected as a result of the Project.	Unlikely

EPBC Act Criteria – is there a real possibility that the Project will:	Assessment of Significance	Significant Impact?
	Potential indirect impacts will be actively managed via Project management plans. As such, the Project is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Cattle and associated grazing practices are known to impact the species via direct trampling, or degradation of habitat via compacting soils and associated fallen woody debris in which the species inhabits. Additionally, invasive weeds degrade species habitat. Due to ongoing grazing practices in the Project Area and the Project Area comprising predominantly of non-remnant land (>95% of the Project Area), cattle impacts and exotic species a prevalent in the landscape. To reduce indirect impacts of the potential for weed infestations to occur as a result of the Project, Westside will implement a Weed Management Procedure. As such, it is not anticipated that the Project will result in an invasive species that are harmful to the species or species habitat becoming established within boggomoss snail habitat.	Unlikely
Introduce disease that may cause the species to decline, or	Disease has not been listed as a threat to this species. However, weed and pest management for the Project will ensure best practice site hygiene measures.	Unlikely
Interfere with the recovery of the species.	A Recovery Plan has been prepared for the species that lists the following key threats (Department of Environment and Heritage Protection, 2017): • Land clearing. • Fire. • Grazing. • Weed infestation. • Earthwork. • Changes to hydrology. As no direct impacts to areas of boggomoss snail habitat (or areas immediately adjacent) are permitted, the Project is unlikely to interfere substantially with the recovery of the species. Additionally, no significant changes in hydrology are anticipated. Indirect impacts are considered very unlikely but will be actively managed via Project management plans regardless.	Unlikely

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FIGURE 9.23A

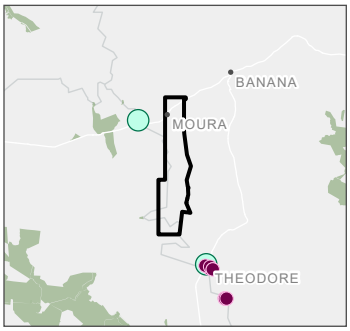
Boggomoss snail *(Adclarkia dawsonensis)* Habitat and Records

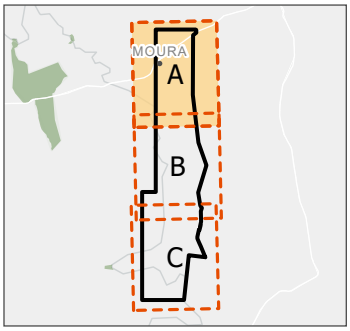
Legend

- ALA Records of Boggomoss Snail
- Weir
- Watercourse
- Project Area
- Existing Westside infrastructure

Boggomoss Snail Habitat

- Breeding and foraging





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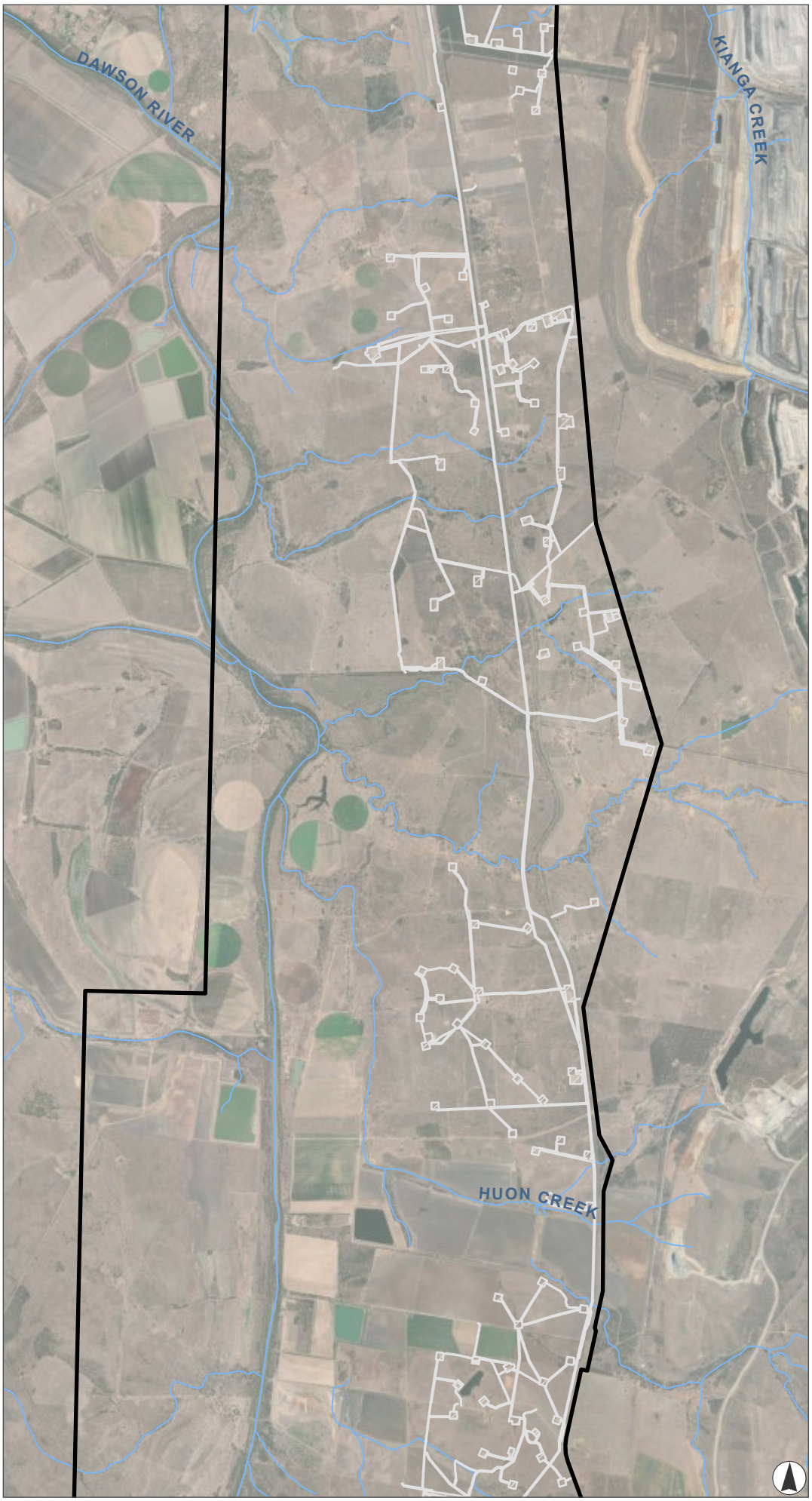


FIGURE 9.23B

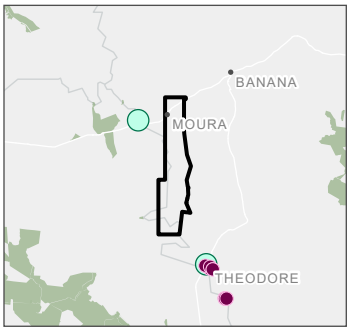
Boggomoss snail *(Adclarkia dawsonensis)* Habitat and Records

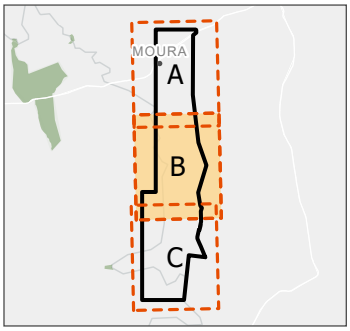
Legend

- ALA Records of Boggomoss Snail
- Weir
- Watercourse
- Project Area
- Existing Westside infrastructure

Boggomoss Snail Habitat

- Breeding and foraging





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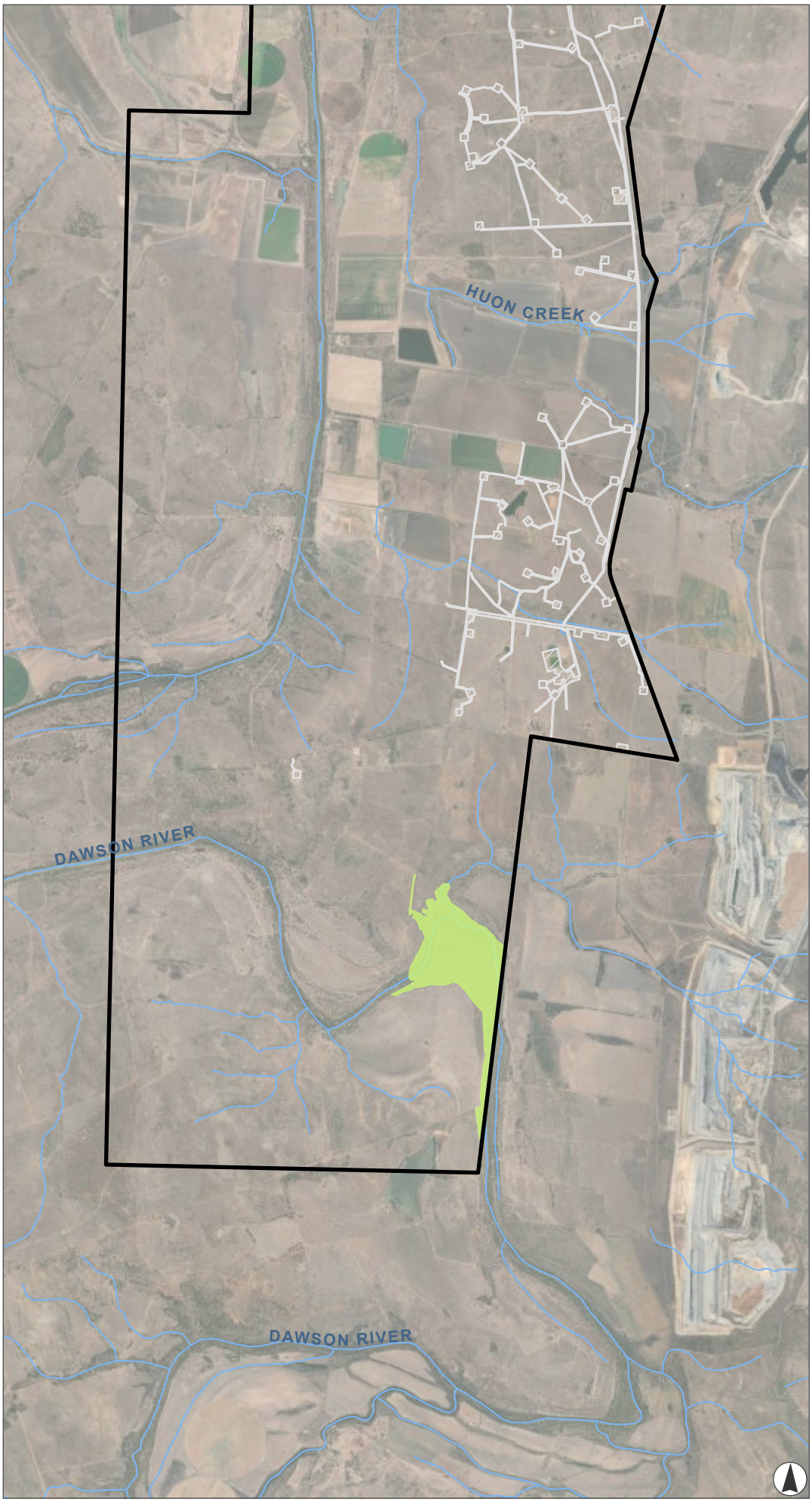


FIGURE 9.23C

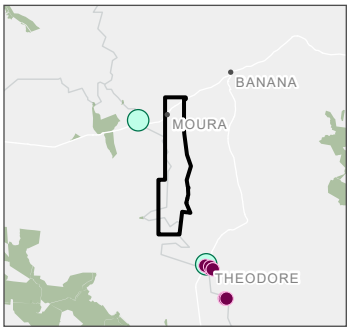
Boggomoss snail *(Adclarkia dawsonensis)* Habitat and Records

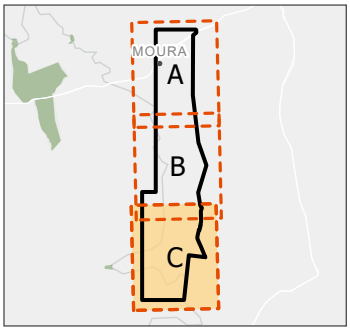
Legend

- ALA Records of Boggomoss Snail
- Weir
- Watercourse
- Project Area
- Existing Westside infrastructure

Boggomoss Snail Habitat

- Breeding and foraging





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10.0 Summary and Conclusion

The aim of this report was to provide technical ecology information to support the PD assessment of the Project and respond to adequacy review comments provided by DCCCEEW relating to Sections 2.0 (Habitat Assessment), 4.0 (Impact Assessment) and 5.0 (Avoidance, Mitigation and Management Measures).

Using a combination of desktop information, field-validated data and extrapolated field survey results, the potential presence and extent of MNES values within the Project Area was determined. A total of 28 MNES were considered known to occur, or to have a moderate or high likelihood of occurring including 3 TECs, 3 threatened flora species, 12 threatened fauna species and 10 migratory species. Known MNES include:

- Brigalow TEC
- Coolibah TEC
- *Solanum dissectum*
- *Solanum johnsonianum*
- *Xerothamnella herbacea*
- Ornamental snake (*Denisonia maculata*)
- Glossy ibis (*Plegadis falcinellus*)
- Caspian tern (*Hydroprogne caspia*).

Potential impacts on known and potentially occurring MNES as a result of the Project were determined (**Section 7.0**). Numerous sources of both direct and indirect impacts were identified, with the greatest risk to MNES occurring during the construction phase as a result of vegetation clearing and associated habitat loss. Other potential impacts include exacerbation of biosecurity risks and disturbance from indirect impacts such as noise, light and dust.

Westside are committed to maximum disturbance limits for all known and potentially occurring MNES (NB: since migratory species are not a relevant controlling provision for the Project as per the referral decision, no disturbance limits have been set for migratory species habitat). For almost all values, minimal disturbance of habitat and populations is proposed.

Significant impact assessments for all known and potentially occurring threatened species and communities were completed in accordance with the *Significant Impact Guidelines 1.1* (Department of the Environment, 2013b). With the implementation of the Protocol and mitigation measures detailed in **Section 8.2**, the findings of the assessments determined that the Project is unlikely to result in a significant impact on all relevant MNES except two:

- Ornamental snake, primarily due to the removal of important habitat (>2 ha).
- Koala, primarily due to the removal of habitat critical to the survival of the species.

To compensate for residual significant impacts on this species as a result of the Project, land-based offsets under the EPBC Act are proposed and detailed in the OAMP (Attachment E of the PD).

11.0 References

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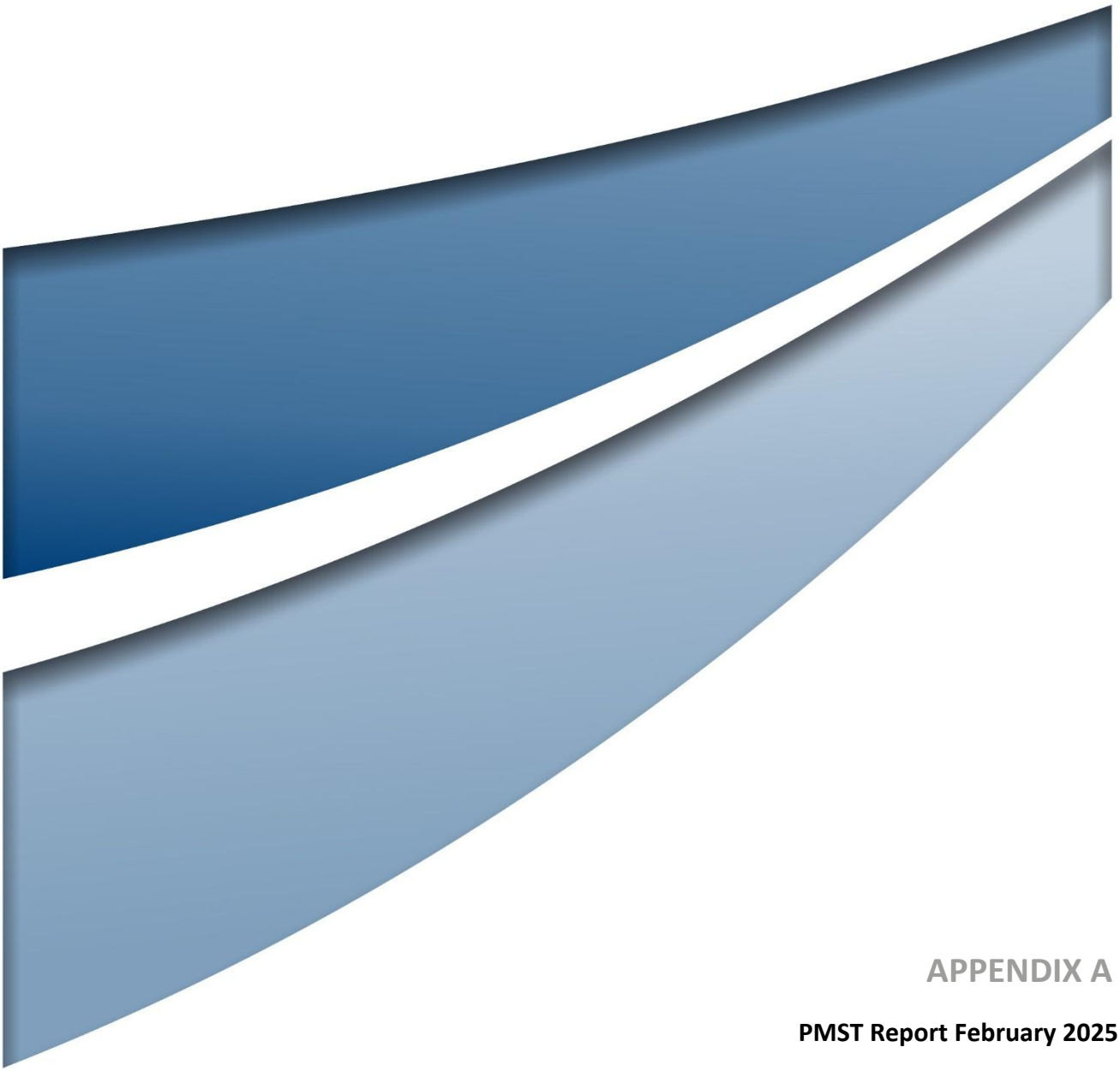

APPENDIX A

PMST Report February 2025

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 14-Feb-2025

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	36
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	19
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	2
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	12
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area	In feature area
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community likely to occur within area	In feature area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community likely to occur within area	In feature area
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	Community likely to occur within area	In feature area
Weeping Myall Woodlands	Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Falco hypoleucos](#) Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area	In feature area
[Geophaps scripta scripta](#) Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Grantiella picta](#) Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area	In feature area
[Hirundapus caudacutus](#) White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area	In feature area
[Neochmia ruficauda ruficauda](#) Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area	In feature area
[Rostratula australis](#) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
[Stagonopleura guttata](#) Diamond Firetail [59398]	Vulnerable	Species or species habitat may occur within area	In feature area
[Turnix melanogaster](#) Black-breasted Button-quail [923]	Vulnerable	Species or species habitat may occur within area	In feature area
MAMMAL			
[Dasyurus hallucatus](#) Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to occur within area	In feature area
[Macroderma gigas](#) Ghost Bat [174]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Nyctophilus corbeni			
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area	In feature area
Petauroides volans			
Greater Glider (southern and central) [254]	Endangered	Species or species habitat known to occur within area	In feature area
Petaurus australis australis			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat likely to occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area	In feature area
PLANT			
Arthraxon hispidus			
Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area	In feature area
Cadellia pentastylis			
Ooline [9828]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Cossinia australiana			
Cossinia [3066]	Endangered	Species or species habitat may occur within area	In buffer area only
Dichanthium queenslandicum			
King Blue-grass [5481]	Endangered	Species or species habitat known to occur within area	In feature area
Dichanthium setosum			
bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Polianthion minutiflorum			
[82772]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Solanum dissectum [75720]	Endangered	Species or species habitat known to occur within area	In feature area
Solanum johnsonianum [84820]	Endangered	Species or species habitat known to occur within area	In feature area
Xerothamnella herbacea [4146]	Endangered	Species or species habitat known to occur within area	In feature area
REPTILE			
Delma torquata Adorned Delma, Collared Delma [1656]	Vulnerable	Species or species habitat may occur within area	In feature area
Denisonia maculata Ornamental Snake [1193]	Vulnerable	Species or species habitat known to occur within area	In feature area
Egernia rugosa Yakka Skink [1420]	Vulnerable	Species or species habitat known to occur within area	In feature area
Elseya albagula Southern Snapping Turtle, White-throated Snapping Turtle [81648]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Furina dunmalli Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area	In feature area
Hemiaspis damelii Grey Snake [1179]	Endangered	Species or species habitat likely to occur within area	In feature area
Rheodytes leukops Fitzroy River Turtle, Fitzroy Tortoise, Fitzroy Turtle, White-eyed River Diver [1761]	Endangered	Species or species habitat known to occur within area	In feature area
SNAIL			
Adclarkia dawsonensis Boggomoss Snail, Dawson River Snail, Dawson Valley Snail [67458]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Marine Species			
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat likely to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Pandion haliaetus](#) Osprey [952]		Species or species habitat likely to occur within area	In feature area

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat likely to occur within area	In feature area
[Anseranas semipalmata](#) Magpie Goose [978]		Species or species habitat may occur within area overfly marine area	In feature area
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
[Bubulcus ibis as Ardea ibis](#) Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In feature area
Pterodroma cervicalis White-necked Petrel [59642]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
[Rostratula australis as Rostratula benghalensis (sensu lato)](#) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Reptile			
[Crocodylus porosus](#) Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area	In feature area

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Highworth Bend	Conservation Park	QLD	In buffer area only
Willawa	Nature Refuge	QLD	In feature area

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
[Baralaba South Coal Project and Transport Corridor, Bowen Basin, QLD](#)	2012/6547		Approval	In feature area
[Theodore Coal Project](#)	2003/992		Completed	In feature area
[Westside Corporation PL94 Coal Seam Gas Project](#)	2021/9117		Assessment	In feature area
Controlled action				
[Construct and operate 447km high pressure gas transmission pipeline](#)	2009/4976	Controlled Action	Post-Approval	In feature area
[ZeroGen Integrated Gasification Combined Cycle Power Plant and CO2 Capture, Transport and Storage](#)	2009/5195	Controlled Action	Completed	In feature area
Not controlled action				
[Baralaba Mine haul road upgrade & private access road, north of Baralaba, Qld](#)	2014/7398	Not Controlled Action	Completed	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Molopo gas fired power station and associated infrastructure	2010/5675	Not Controlled Action	Completed	In feature area
Molopo Gas Fired Power Station and Associated Infrastructure	2010/5416	Not Controlled Action	Completed	In feature area
Moura Solar Farm	2021/8973	Not Controlled Action	Completed	In buffer area only
Queensland Nitrates Pipeline Project Theodore - Baralaba Road, Moura, QLD	2014/7371	Not Controlled Action	Completed	In feature area
Surat Basin Railway	2008/3944	Not Controlled Action	Completed	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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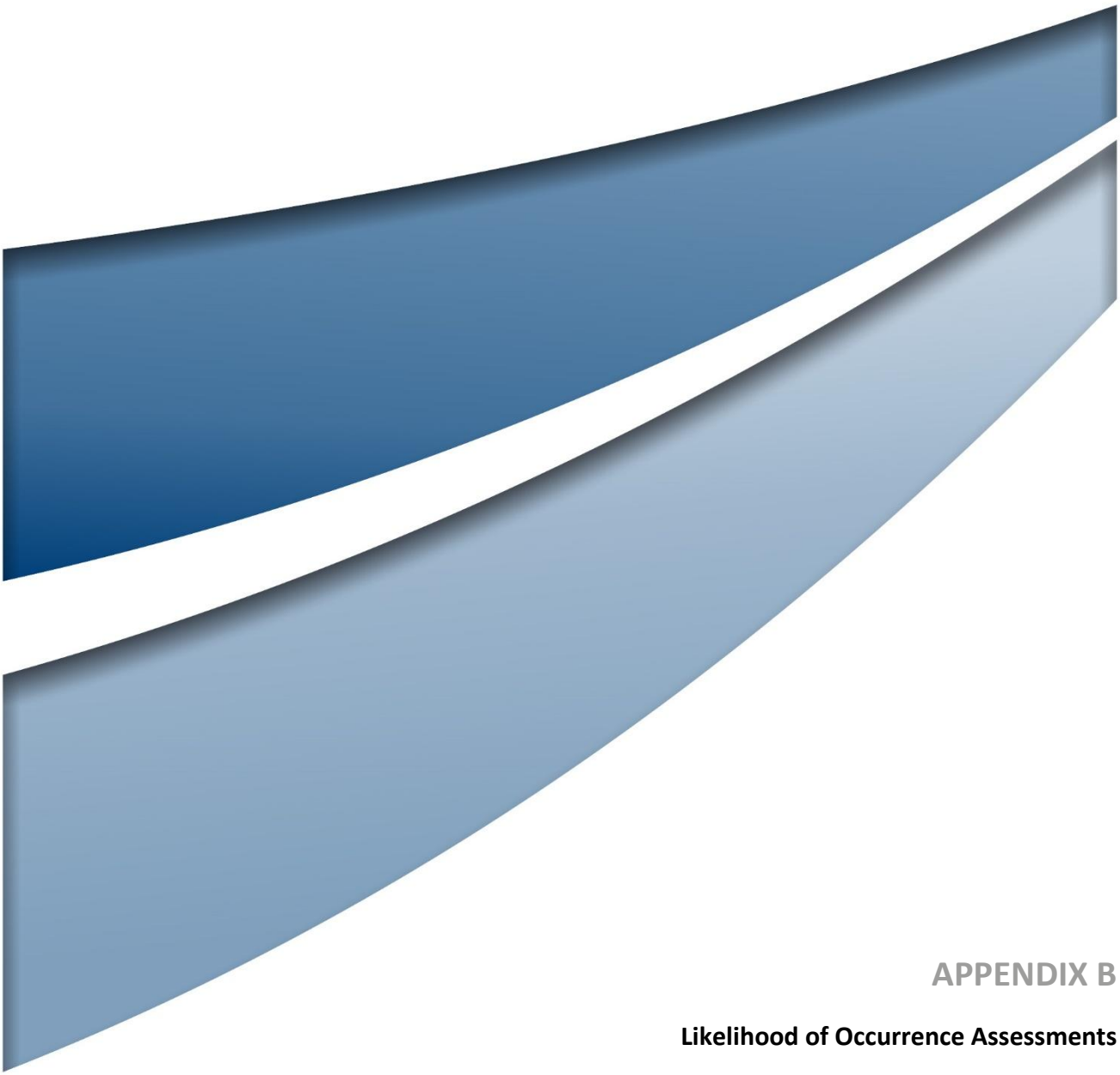


APPENDIX B

Likelihood of Occurrence Assessments

Table B.1 Likelihood of Occurrence Assessment[10]

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Threatened Ecological Communities			
Brigalow (*Acacia harpophylla* dominant and co-dominant)	Endangered	The community is characterised by the presence of *Acacia harpophylla* either dominant in the tree layer, or co-dominant with other species – notably *Casuarina cristata*, other *Acacia* spp. or *Eucalyptus* spp. Occasionally these other species may be more common than *A. harpophylla*. The TEC has a considerable range of vegetation structure and composition united by a suite of species that tend to occur on acidic and salty clay soils. Corresponding REs in the Brigalow Belt Bioregion include: 11.3.1, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.5.16, 11.9.1, 11.9.5, 11.9.6, 11.11.14, 11.12.21. Key diagnostic criteria and condition thresholds must be assessed during field surveys to conclusively determine if analogous REs meet TEC status.	**Known** Brigalow TEC has been confirmed within the Project Area as part of the field survey program. Known TEC locations are associated with REs 11.3.1, 11.4.8 and 11.4.9. Additional areas of potential Brigalow TEC within the Project Area are associated with REs 11.3.1, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.9a, 11.9.1 and 11.9.5 (remnant and regrowth condition).
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	The community occurs as a semi-arid to humid subtropical woodland where *Eucalyptus coolabah* subsp. *coolabah* and/or *E. largiflorens* are the dominant canopy species and where the understorey tends to be grassy. It is found on the grey, self-mulching clays of periodically waterlogged floodplains, swamp margins, ephemeral wetlands, and stream levees. Within the Brigalow Belt, the TEC is limited to the Brigalow Belt South Bioregion and includes the following corresponding REs when in QLD: include: 11.3.3, 11.3.15, 11.3.16, 11.3.28, 11.3.37. Key diagnostic criteria and condition thresholds must be assessed during field surveys to conclusively determine if analogous REs meet TEC status.	**Known** Coolibah TEC has been confirmed within the Project Area as part of the field survey program associated with RE 11.3.3. Additional areas of potential Coolibah TEC are also identified within the Project Area. All patches are in proximity to the Dawson River and associated floodplain.

[10] Assessment was completed as part of the Project's referral. Assessments have not been updated; although new species identified on the PMST have been included.
[11] Listing status under the EPBC Act is considered valid as of the referral decision date (30 June 2022).

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	The community is typically a grassy woodland with a canopy dominated by *Eucalyptus populnea* and understorey mostly of grasses and other herbs. It mostly occurs in gently undulating to flat landscapes and occasionally on gentle slopes on a wide range of soil types of alluvial and depositional origin. Corresponding REs in the Brigalow Belt Bioregion include: 11.3.2, 11.3.17, 11.4.7, 11.4.12. Key diagnostic criteria and condition thresholds must be assessed during field surveys to conclusively determine if analogous REs meet TEC status.	**High** This TEC was not recorded during the field survey program, however analogous REs have been confirmed present and are identified in the State RE mapping comprising REs 11.3.2, 11.3.17 and 11.4.7.
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	Semi-evergreen vine thicket is considered an extreme form of dry seasonal subtropical rainforest, occurring in areas with a subtropical, seasonally dry climate on soils of high to medium fertility. It is generally characterised by the prominence of trees with microphyll sized leaves (2.5–7.5 cm long) and the frequent presence of *Brachychiton australis/B. rupestris* as emergent. Corresponding REs in the Brigalow Belt Bioregion include: 11.2.3, 11.3.11, 11.4.1, 11.5.15, 11.8.3, 11.8.6, 11.8.13, 11.9.4, 11.9.8, 11.11.18. There are no key diagnostic or condition threshold criteria.	**Low** This TEC was not recorded during the field surveys, however, in areas not field-verified, the State RE mapping shows a small, mixed polygon area (<2 ha) of two REs 11.9.5/11.9.4 (70/30%). RE 11.9.4, if present, can correspond to the TEC, however, given it only comprises 30% of the patch, and upon aerial photography interpretation (API), it appears the patch is dominated by brigalow (analogous to RE 11.9.5) evident by a grey/blue shade on the aerial, opposed to a bright green that would be expected for a SEVT dominated patch. Given the low percentage (30%) of a State mapped RE that could be potentially analogous vegetation, and investigation via API, there is a low likelihood that the TEC would occur in the Project Area.
Weeping Myall Woodlands	Endangered	The community occurs as open woodlands to woodlands, generally 4–12 m high, in which *Acacia pendula* is the sole or dominant overstorey species. Other species including *Alectryon oleifolius* subsp. elongatus, *Eucalyptus populnea* or *E. largiflorens* may also occur, though not as dominant species. Corresponding REs in the Brigalow Belt Bioregion include components of 11.3.2 and 11.3.28. Key diagnostic criteria and condition thresholds must be assessed during field surveys to conclusively determine if analogous REs meet TEC status.	**Low** While the TEC can form components of RE 11.3.2 which is mapped in the Project Area, all areas of this RE that have been surveyed to date and have been field-verified to be dominated by *Eucalyptus populnea*. The presence of *Acacia pendula* within the Project Area has not been identified in any field survey and there are no nearby records of the species on ALA (2024). The presence of *Acacia pendula* is a key diagnostic feature of the community, and given its absence to date, the TEC has a low likely of occurrence.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Threatened Flora			
Hairy-joint grass *Arthraxon hispidus*	Vulnerable	In Australia, the species has been recorded from scattered locations throughout QLD and on the northern tablelands and north coast of NSW. The species is found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps, as well as woodland. In south-east QLD it has also been recorded growing around freshwater springs on coastal foreshore dunes, in shaded small gullies, on creek banks, on sandy alluvium in creek beds in open forests, and with bog mosses in mound springs.	**Low** Only a small portion of the species 'may occur' as per SPRAT distribution overlaps with the Project Area. Although located outside of south-east QLD, the Project Area contains some woodlands on alluvial substrates and near watercourses which may potentially provide suitable habitat. However, no ALA records occur within the desktop search extent. The closest records occur at the Boggomoss Nature Refuge, approximately 63 km south of the Project Area. Further, the species has not been observed during various field surveys that have been conducted in the Project Area.
Ooline *Cadellia pentastylis*	Vulnerable	Species occurs in a range of vegetation types including semi-evergreen vine thicket, brigalow-belah, poplar box and bendee communities. Ooline often occurs on the edges of sandstone and basalt escarpments, 200 to 500 m ASL. In most areas of its range, ooline grows on the moderately fertile soils preferred for agriculture and pasture development.	**Low** The Project Area occurs primarily within the species 'likely to occur' distribution extent as per SPRAT. As per the State mapping, a single patch of preferred vine thicket habitat (a mixed polygon of REs 11.9.5/11.9.4 70%/30%) for the species may occur within the Project Area. However, as described above this area is likely to be dominated by brigalow. Records for the species within the region are uncommon and none occur within the desktop search extent. The nearest ALA records (1937 and 1949) occur approximately 28 km to the northeast near Belldeen Defence Road. Extensive land clearing has occurred in the region since those records were observed. Further, the species is readily identifiable and has not been observed during field surveys conducted to date.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Cossinia *Cossinia australiana*	Endangered	The species' distribution is from Rockhampton to Kingaroy, east of the Great Dividing Range, a distance of approximately 300 km. At most sites it is recorded as uncommon, usually as scattered individuals. *Cossinia* is known from fragmented relict patches of *Araucarian* vine forests or vine thickets on fertile soils.	**Unlikely** Only a small portion of the species 'may occur' distribution extent as per SPRAT overlaps with the Project Area. A single patch of potentially suitable habitat may occurs within the Project Area comprising dry vine thicket as per the State mapping (mixed polygon of REs 11.9.5/11.9.4 70%/30%). As described above, it is likely this patch is wholly dominated by brigalow. No records of the species occur within the desktop search extent. The closest record occurs at the Montour State Forest, 60 km east of the Project Area. Publicly available records suggest the species is associated with rocky areas and complex vegetation communities (i.e. rainforest and closed forest), which are absent from the Project Area.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
King blue-grass *Dichanthium queenslandicum*	Endangered	King blue-grass is endemic to central and southern QLD where it occurs in three disjunct populations: 1) Hughenden district (one record); 2) from Nebo to Monto and west to Clermont and Rolleston; and 3) Dalby district, Darling Downs. The species occurs on black cracking clay in tussock grasslands mainly in association with other species of blue grasses (*Dichanthium* spp. and *Bothriochloa* spp.) but also with other grasses restricted to this soil type. *Dichanthium Queenslandicum* is mostly confined to natural grassland on the heavy black clay soils (basalt downs, basalt cracking clay, open downs) on undulating plains.	**Low** The Project Area occurs within the species 'may occur' distribution extent as per SPRAT. The species is threatened by exotic grass invasion to natural grasslands, primarily occurring on basalt derived soils in which it occurs. The Project Area has been significantly modified and is dominated by exotic grassland, such as *Cenchrus ciliaris** (buffel grass) and *Urochloa mosambicensis*, with large areas of cropping. As per Q Imagery, 2024), broadscale land clearing is evident on historical imagery within the Project Area since at least approximately 1965 (with woody vegetation seen on imagery in 1953). Native grasslands on cracking clays are not mapped within the Project Area, nor have they been confirmed during any field survey. Suitable habitat is considered absent. The species has not been recorded during any field surveys and no ALA records occur within the Project Area. Records from 2012 are present to the east (the closest approximately 10 km east close to the species' core distribution) along the Leichhardt Highway. Both records are associated with native grassland habitat dominated by *Dichanthium sericeum* (and *Bothriochloa erianthoides* at one site) as per the specimen samples.
Blue grass *Dichanthium setosum*	Vulnerable	In QLD the species has been reported from the Leichhardt, Morton, North Kennedy and Port Curtis regions. This species occurs in the Mistake Range, in Main Range National Park, and possibly on Glen Rock Regional Park, adjacent to the national park. *Dichanthium setosum* occurs in heavy soils (predominantly cracking clays or alluvium, often in gilgai) in woodland or open woodland usually dominated by *Acacia* (brigalow) and/or *Eucalyptus* species. The climate is tropical to subtropical and markedly seasonal with the habitat drying out for part of the year.	**Low** The western Project Area occurs within the species 'may occur' and 'likely to occur' distribution extent as per SPRAT. Although exotic grasses are common, woodlands on clay or alluvium soils occur within the Project Area and may provide suitable habitat in places. However, no records exist within the desktop search extent or wider region. The nearest ALA record is located near Rolleston, approximately 160 km to the west of the Project Area.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Polianthion minutiflorum	Vulnerable	The species is known from five areas in east QLD, from Redcliffe Vale, about 110 km west of Mackay, south to Kingaroy, covering a distance of approximately 800 km. It grows in forest and woodland on sandstone slopes and gullies with skeletal soil, or deeper soils adjacent to deeply weathered laterite.	**Unlikely** The Project Area overlaps small parts of the species 'may occur' distribution extent, located along the Theodore-Baralaba Road and near the Dawson River. The species is known from only five locations in QLD and is specific in the soil types it prefers. Suitable habitat is unlikely to occur within the Project Area given its dominance by cracking clays, with no sandstone or laterite geologies mapped nor likely to occur based on field verifications. No ALA records occur within the desktop search extent. The nearest ALA record is dated 2018 and is located approximately 35 km to the west of the Project Area associated with a forest community on sandstone (RE 11.10.4 as per the State mapping).
Solanum dissectum	Endangered	Found within a region bounded by the towns of Blackwater to Bauhinia to Thangool to Dululu, which is centred about 150 km due west of Gladstone. Occurs in open forest and woodland habitats where brigalow (*Acacia harpophylla*) and/or lapunyah (*Eucalyptus thozetiana*) characterise the dominant vegetation types on solodic clay soils.	**Known** This species was recorded from one location in the northern Project Area during the 2019 Umwelt field survey. The species was recorded in association with remnant woodland of *Acacia harpophylla* and *Eucalyptus thozetiana*. Habitat for the species occurs in association with brigalow and lapunyah communities that are scattered throughout the Project Area.
Solanum johnsonianum	Endangered	Found within a region bounded by the towns of Rolleston to Theodore to Biloela to Dululu, which is centred about 160 km due west of Gladstone. Found in open forest and woodland habitats where brigalow (*Acacia harpophylla*) dominates or co-dominates on heavy cracking clay soils.	**Known** This species has been recorded from seven locations across the Project Area during the field survey program. Recent ALA records (dated 2014, 2015 and 2022) for the species exist within the far north-eastern Project Area, located immediately north of the Dawson Highway. A historical ALA record (dated 1963) also occurs in the central Project Area, north of Kianga River Road. Suitable habitat occurs across the Project Area associated with brigalow (*Acacia harpophylla*).

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Xerothamnella herbacea	Endangered	Species occurs in brigalow (*Acacia harpophylla*) dominated communities in shaded situations, often in leaf litter and is associated with gilgais (shallow ground depressions). Soils are heavy, grey to dark brown clays.	**Known** This species has been recorded from two discrete locations along Kianga Creek within the northern Project Area, always in conjunction with brigalow (*Acacia harpophylla*). Habitat for the species occurs in association with brigalow communities that are scattered throughout the Project Area.
Threatened Fauna			
Birds			
Sharp-tailed sandpiper *Calidris acuminata*	Species listed as Vulnerable under EPBC Act on 5 Jan 2024 (after referral decision date). No assessment required. Species is listed as Migratory and has been assessed in the Migratory Wetland Species section.		
Curlew sandpiper *Calidris ferruginea*	Critically Endangered/ Migratory	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one year old birds remain in Australia rather than migrating north. In QLD, scattered records occur in the Gulf of Carpentaria, with widespread records along the coast south of Cairns. There are sparsely scattered records inland. Curlew sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters.	**Low** The Project Area occurs within the 'may occur' extent of the species distribution. Preferred intertidal/coastal habitat is absent from the Project Area. Farm dams may provide marginally suitable, temporary habitat during extended periods of rainfall whilst individuals complete migratory movements. A single ALA record from 2019 occurs within the southern Project Area. However, the record has a 10,000 m spatial uncertainty associated with it. Additional information was requested from the record author who advised that the point is based on 'light-level geolocation' and spatial inaccuracy could be up to 500 km. No other ALA records occur within >100 km of the Project Area.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Red goshawk *Erythrotriorchis radiatus*	Vulnerable (listed Endangered after the referral decision date)	The red goshawk is endemic to Australia. It is very sparsely dispersed across approximately 15% of coastal and sub-coastal Australia, from western Kimberley Division (north of 19°S) to northeastern NSW (north of 33°), and occasionally on continental islands. The species occurs in coastal and sub-coastal tall open forests and woodlands, preferring areas with a mosaic of vegetation types, permanent water, and abundant small birds. They avoid very dense and very open habitats (Marchant & Higgins 1993). Associated with gorge and escarpment country in partially cleared country in eastern QLD. In eastern Australia, populations seem to move from inland nest sites to coastal plains in winter, thus occupying home ranges of 50–220 km^2.	**Low** The Project Area occurs within the 'may occur' extent of the species distribution. Mosaics of intact vegetation are absent from the Project Area and local area and broadscale land clearing has been evident in the region for >60 years (Q Imagery, 2024). The Dawson River and associated riparian habitat represents the only potentially suitable vegetation for the species, however, given its reliance on having a mosaic of vegetation types present that host a high abundance of preferred bird species on which it feeds (cockatoos, lorikeets and kookaburras), there is a low possibly of it using the Project Area. No ALA records occur within the desktop search extent. The nearest record is unconfirmed, dated 1870 and occurs approximately 52 km to the north west near Mimosa Park Nature Refuge which is highly vegetated. However, it has a 38 km spatial uncertainty.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Grey falcon *Falco hypoleucos*	Vulnerable	The species occurs in arid and semi-arid Australia, including the Murray-Darling Basin, Eyre Basin, central Australia and Western Australia. The species is mainly found where annual rainfall is less than 500 mm, except when wet years are followed by drought when the species might become marginally more widespread, although it is essentially confined to the arid and semi-arid zones at all times. The species frequents timbered lowland plains, particularly *Acacia* shrublands that are crossed by tree-lined water courses. It has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter.	**Low** The Project Area occurs within the species 'may occur' and 'likely to occur' distribution extent as per SPRAT. The Project Area supports *Acacia* shrubland and open woodland, however, this is primarily formed by brigalow regrowth and remnant patches that would have previously formed open forests rather than typical *Acacia* shrublands of the semi-arid zone in which the species prefers. Further, the Project Area location and surrounding region is not considered arid or semi-arid. Additionally, the species is mainly found where annual rainfall is less than 500 mm and the Project Area has a mean annual rainfall of approximately 650 mm (Thangool Airport BoM Station #039089). As such, the potential habitat present is unlikely to be suitable. There is one undated ALA record within the central Project Area, and another 15 km south of the Project Area. Both records are likely to have very high levels of spatial uncertainty due to the lack of precision in the GPS location provided (i.e. -24.7, 150). Records do not appear to have been generalised due to sensitivity concerns. The combination of no date records and a low GPS precision warrants caution to the records. No eBird records occur in the region of the Project Area (eBird, 2024).
Latham's snipe *Gallinago hardwickii*	Species listed as Vulnerable under EPBC Act on 5 Jan 2024 (after referral decision date). No assessment required. Species is listed as Migratory and has been assessed in the Migratory Wetland Species section.		

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Squatter pigeon (southern) *Geophaps scripta scripta*	Vulnerable	The known distribution of the squatter pigeon (southern) extends south from the Burdekin-Lynd divide in the southern region of Cape York Peninsula to the Border Rivers region of northern NSW, and from the east coast to Hughenden, Longreach and Charleville, QLD. Overall, the subspecies' known distribution is estimated to occur within the latitudes, 17° to 30° S, and the longitudes, 141° to 153° 30' E. The species occurs in open, dry woodland with a grassy understorey in proximity to permanent water. Prefers areas of sandy soil with sparser cover of low grasses; and less common on heavier soils with dense grass cover. In QLD, squatter pigeon (southern) foraging and breeding habitat is known to occur on well-draining, sandy or loamy soils on low, gently sloping, flat to undulating plains and foothills (i.e. QLD Regional Ecosystem land zone 5), and lateritic (duplex) soils on low 'jump-ups' and escarpments (i.e. Land zone 7), as well as alluvial (i.e. Land zone 3).	**Moderate** The Project Area occurs within the 'likely to occur' extent of the species distribution. Woodlands on land zone 3 are confirmed to occur within the Project Area, with woodlands on land zone 5 also possibly present as per State mapping. The subspecies has not been recorded during field surveys and no ALA records occur within the desktop search extent. The nearest ALA record of the subspecies (dated 2001) occurs approximately 34 km to the south-west of the Project Area within Theodore State Forest. Several records of the subspecies occur within the State Forest area. Six records of the species (i.e. *Geophaps scripta*) occur within 20 km, including one within the Project Area. The record located within the Project Area is sourced from ALA via the Historical Bird Atas managed by BirdLife Australia, is undated and has a 10 km spatial uncertainty. These records may be of the subspecies.
Painted honeyeater *Grantiella picta*	Vulnerable	The species is sparsely distributed from south-eastern Australia to north-western QLD and eastern Northern Territory. The greatest concentrations and almost all records of breeding come from south of 26ºS, on inland slopes of the Great Dividing Range between the Grampians, Victoria and Roma, QLD (Higgins et al. 2001). The species exhibits seasonal north-south movements governed principally by the fruiting of mistletoe, with which its breeding season is closely matched. The species inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of *Eucalyptus largiflorens* and *E. camaldulensis*, box-ironbark-yellow gum woodlands, *Acacia*-dominated woodlands, *Melaleuca*, *Casuarina* or *Callitris* woodlands, and trees on farmland or in gardens. The species prefers woodlands which contain a higher number of mature trees, as these host more mistletoes.	**Moderate** The Project Area occurs within the 'may occur' extent of the species distribution. Suitable habitat exists throughout the Project Area including eucalypt and *Acacia harpophylla* woodlands which may host mistletoe (primary food source). Records of the species in the region are generally rare and none occur within the desktop search extent. The closest ALA record (dated 2017) is located approximately 28 km south of the Project Area along the Leichardt Highway. This record sourced from BirdLife Australia was supported with a 'unusual record report form' given the species' previous absence from the wider area. A review of eBird also shows the species infrequent occurrence within the region (eBird, 2024).

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
White-throated needletail *Hirundapus caudacutus*	Vulnerable/ Migratory	The species is found across a range of habitats, more often over wooded areas, where it is almost exclusively aerial, though does roost in tree hollows and the foliage canopy. It forages for insects on the wing; flying anywhere between "cloud level" and "ground level" and readily forms mixed feeding flocks with other aerial insectivores. The species roosts at night in the crowns of tall trees, mainly in forest habitats. The species moves gradually southward in eastern Australia, and in the south it is most common late in the summer (Feb-Mar or early April), and has become increasingly rare at all times but especially in the Oct-Dec period.	**Moderate** The Project Area occurs within the species 'may occur' distribution extent as per SPRAT. This species has broad habitat requirements given its aerial nature and only occurs in Australia during its non-breeding season. As such, the entire Project Area may provide suitable habitat. Two ALA records of the species occur within the desktop search extent (one undated and the other from 2014); both are located to the west of the Project Area along the Dawson River. According to eBird, the species may utilise the Project Area occasionally during its pre- and post-breeding migration to and from Australia (eBird, 2024).
Star finch (eastern) *Neochmia ruficauda ruficauda*	Endangered	The distribution of the star finch (eastern) is very poorly known. The subspecies occurs only in central QLD. Recent records have been obtained only from scattered sites in central QLD (i.e. between 21°S and 25°S, and 141°E and 150°E) and consequently, the star finch (eastern) now appears to be extinct in both south-eastern QLD and northern NSW. It occurs mainly in grasslands and grassy woodlands that are located close to bodies of fresh water.	**Low** The Project Area occurs within the species 'may occur' and 'likely to occur' distribution extent as per SPRAT. supports suitable habitat associated with eucalypt woodlands near water sources occurs in association with the Dawson River. However, no ALA records occur in the desktop search extent or wider local area. The nearest ALA record (undated with 3,600 m spatial uncertainty) occurs approximately 75 km to the south east, north of Taroom. The subspecies is presumed extinct (Pizzey & Knight, 2024). No contemporary records of star finch (eastern) are available, with all star finch records in eBird limited to the western (*subclarescens*) and northern (*clarescens*) subspecies.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Australian painted snipe *Rostratula australis*	Endangered	The Australian painted snipe has been recorded at wetlands in all states of Australia. It is most common in eastern Australia, where it has been recorded at scattered locations throughout much of QLD, NSW, Victoria and south-eastern South Australia. It generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. They sometimes utilise areas that are lined with trees, or that have some scattered fallen or washed-up timber (Marchant & Higgins 1993). As per the species' National Recovery Plan, gilgai micro relief, comprising extensive systems of small mounds (e.g. 1 to 3 m in diameter) and hollows (e.g. up to 0.5 m deep), is especially suitable; wetlands with gilgai are abundant in seasonal and other temporary wetlands of Australia, especially in the Murray–Darling, arid and savannah regions on clay soils.	**Moderate** The Project Area occurs within the species 'may occur' distribution extent as per SPRAT. No ALA records occur within the desktop search extent. The nearest ALA record (dated 2000) occurs approximately 35 km to the south-east near the Dawson River. The record has been sourced from WildNet (Queensland Wildlife Data), has 999 m spatial uncertainty and is associated with the 'Lagoona' locality. Two additional records occur further south; the next closest is undated and has been generalised by 10 km while the third is an OZCAM record from 1977. No eBird records for the species are present in the region, with the closest records closer to the eastern coastline (eBird, 2024). The Project Area may provide seasonal habitat for the species when inundated. Preferred shallow wetland habitat is absent from the Project Area including lakes, swamps and claypans, however two mapped High Ecological Significance wetlands are located immediately west of the Project Area. Extensive areas of gilgai formations and farm dams may provide temporary suitable habitat during extended periods of rainfall whilst individuals complete local or seasonal movements. However, native ground-layer species are generally rare, and fringing aquatic vegetation surrounding gilgais infrequent.
Diamond firetail *Stagonopleura guttata*	Species listed as Vulnerable under EPBC Act on 31 March 2023 (after referral decision date). No assessment required.		

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Black-breasted button-quail *Turnix melanogaster*	Vulnerable	The black-breasted button-quail is endemic to eastern Australia. It is restricted to coastal and near-coastal regions of south-eastern QLD and north-eastern NSW. The main populations occur within south-east QLD. The black-breasted button-quail is restricted to rainforests and forests, mostly in areas with 770-1200 mm rainfall per annum. They prefer drier low closed forests, particularly semi-evergreen vine thicket, low microphyll vine forest, araucarian microphyll vine forest and araucarian notophyll vine forest. They may also be found in low, dense acacia thickets and, in littoral area, in vegetation behind sand dunes. Many areas of optimum habitat are located on highly fertile soils.	**Unlikely** The Project Area is unlikely to contain potential habitat associated with vine thicket, and the annual rainfall for the local area (a mean annual rainfall of approximately 650 mm as per the Thangool Airport BoM Station #039089), is below the species' usual tolerance. No ALA records occur within the desktop search extent. The nearest ALA record (undated) occurs approximately 15 km south of the Project Area. The record location has been generalised by 10 km due to sensitivity concerns. However, spatial uncertainty may be substantially greater than 10 km due to the lack of precision in the GPS location supplied (-25, 150). The next closest record is from 1964 and occurs approximately 35 km to the north. Broadscale land clearing since this dated record has occurred, and the modification of the landscape is unlikely to support the species. According to eBird, the closest known record is near Monto, and is surrounded by extensive tracts of vegetation (eBird, 2024).
Mammals			
Northern quoll *Dasyurus hallucatus*	Endangered	The northern quoll is known to occur as far south as Gracemere and Mt Morgan, south of Rockhampton, as far north as Weipa in QLD and extends as far west into central QLD to the vicinity of Carnarvon Range National Park. The species occupies a diversity of habitats including rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands, and beaches, shrubland, grasslands and desert. The species is also known to occupy non-rocky lowland habitats such as beach scrub communities in central QLD. The species generally encompasses some form of rocky area for denning purposes, with surrounding vegetated habitats used for foraging and dispersal. Rocky habitats are usually of high relief, often rugged and dissected.	**Unlikely** The Project Area occurs covers both parts of the species 'may occur' and 'likely to occur' distribution extents. The Project Area lacks preferred rocky habitat. Except for habitat associated with the Dawson River, woodland remnants which exist across the Project Area are unlikely to provide suitable habitat for this species due the typical small patch size and degree of existing disturbance. One ALA record (event occurrence date not provided but identified in 1992) associated with the Online Zoological Collections of Australian Museums (OZCAM) occurs within the desktop search extent, located immediately west of the Project Area near the Dawson River. Two additional ALA records occur within 30 km of the Project Area dated 1961 and 1966. This information suggests that northern quoll may have historically inhabited the area, prior to agricultural development.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Ghost bat *Macroderma gigas*	Vulnerable	The species' current range is discontinuous, with geographically disjunct colonies occurring in the Pilbara, Kimberley (including several islands), Northern Territory (including Groote Eylandt), the Gulf of Carpentaria, coastal and near coastal eastern QLD from Cape York to near Rockhampton, and western QLD. Only 14 breeding sites are currently known. The species occupies a range of habitats from the arid Pilbara to tropical savanna woodlands and rainforests. Roost sites include caves, rock crevices and disused mine shafts.	**Unlikely** Only a portion of the southern Project Area occurs within the species 'may occur' distribution extent as per SPRAT. However, BatMaps (2024) distribution mapping for the species suggests the Project Area is well outside of the predicted range for the species. Cliffs and other steep rocky areas (i.e. potential roosting habitat) are absent from the Project Area and immediate surrounds. There are no ALA records within the desktop search extent or wider local area. The nearest ALA record (dated 1985) occurs approximately 45 km to the north east of the Project Area near Overdeen State Forest.
Corben's long-eared bat *Nyctophilus corbeni*	Vulnerable	The south-eastern long-eared bat is found in southern central QLD, central western NSW, north-western Victoria and eastern South Australia, where it is patchily distributed, with most of its range in the Murray Darling Basin. Most records are from inland of the Great Dividing Range. The species inhabits a range of inland dry forest habitats including *Eucalyptus camaldulensis*, mallee, brigalow (*Acacia harpophylla*) and other arid and semi-arid habitats; in southern QLD it is more common in box/ironbark and Callitris forests on sandy soils. The species is most abundant in vegetation with a distinct canopy and a dense, cluttered shrub layer, and in large, continuous remnants. Roosts solitarily in tree hollows, crevices, and under loose bark (particularly on dead *Allocasuarina luehmannii* or *Casuarina cristata*).	**Low** The Project Area occurs within the species' mapped 'may occur' distribution as per SPRAT. However, BatMaps (2024) distribution mapping for the species suggests the Project Area is outside of the predicted range for the species. The species relies on large continuous remnants of vegetation. As such, potential habitat is limited to woodlands associated with the Dawson River. No ALA records occur within the desktop search extent or wider local area. The nearest ALA record is located approximately 54 km south of the Project Area near Precipice National Park.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Greater glider (southern and central) *Petauroides volans*	Vulnerable (listed Endangered after referral decision date)	Species largely restricted to eucalypt forests and woodlands. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows.	**High** The Project Area occurs within the species 'likely to occur' distribution extent as per SPRAT. Suitable habitat for the species within the Project Area is predominately concentrated within riparian habitat along the Dawson River, where habitat exhibits connectivity. One ALA record (undated) associated with OZCAM occurs within the desktop search extent, located immediately west of the Project Area near the Dawson River. Two additional ALA records occur within 30 km of the Project Area, also undated and associated with OZCAM.
Yellow-bellied glider (south-eastern) *Petaurus australis australis*	Vulnerable	The species occurs in eucalypt-dominated woodlands and forests, including both wet and dry sclerophyll forests. It shows a preference for large patches of mature old growth forest that provide suitable trees for foraging and shelter. There is also a clear preference for forests with a high proportion of winter-flowering and smooth-barked eucalypts. The species requires some level of floristic diversity to provide a year-round food supply and are unlikely to persist in forests dominated by only one or two tree species.	**Moderate** The Project Area occurs within the subspecies 'may occur' distribution extent as per SPRAT. Potential habitat for the species is limited to the riparian habitat along the Dawson River, noting the species' large home range requirements. As the species requires a level of floristic diversity to provide a year-round food supply, the species is unlikely to persist in forests dominated by only one or two tree species, such as the section of the Dawson River which is dominated by one or two tree species. An ALA record from 1929 occurs within the southern Project Area along the Dawson River, however this record is reported to have a 54 km spatial uncertainty and the region has undergone large scale land clearing since that time (Q Imagery, 2024). Another ALA record occurs 7 km south of the Project Area along the Dawson River (undated with 9000 m spatial uncertainty). The low spatial accuracy of these records leaves some uncertainty as to whether they would be associated with the Dawson River.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Koala *Phascolarctos cinereus*	Endangered	The koala is a wide-ranging marsupial endemic to Australia. It typically occurs in eastern Australian forests and woodlands of predominantly *Eucalyptus* species. Its historical range extends over 22° of latitude and 18° of longitude. The koala's distribution is not continuous across this range and it occurs in several subpopulations that are separated by cleared land or unsuitable habitat. Koala habitat includes both coastal and inland areas that are typically characterised by *Eucalyptus* forests and woodlands. The wide-ranging distribution of the koala has resulted in a diverse range of habitat associations across different bioregions, influenced by local climate, topographical and landscape associations. Biophysical habitat attributes for the koala include places that contain the resources necessary for individual foraging, survival (including predator avoidance), growth, reproduction and movement.	**High** The Project Area occurs within the species 'likely to occur' distribution extent as per SPRAT. This species is known to utilise highly modified environments. Habitat suitable for all lifecycle requirements occurs within the Project Area. Several ALA records for the species occur within the desktop search extent, including one (undated) within the Project Area associated with the township of Moura and another immediately west of the Project Area near the Dawson River (OZCAM and undated). The record located within the Project Area, in the township of Moura, has been sourced from WildNet's (Queensland Wildlife Data) Historical Fauna Database, is unconfirmed and has 1800 m spatial uncertainty. Of the other records within the desktop search extent, dates include 1970, 1982, 1992, 1996 and 1997.
Grey-headed flying-fox *Pteropus poliocephalus*	Vulnerable	The grey-headed flying-fox is Australia's only endemic flying-fox and occurs in the coastal belt from Rockhampton in central QLD to Melbourne in Victoria. They are usually found on the coastal lowlands and slopes of eastern Australia below altitudes of 200 m. It requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands. Grey-headed flying-foxes forage over extensive areas and have been known to fly as far as 40 km to feed, before returning to their roost the same night.	**Low** The Project Area occurs within the species 'may occur' distribution extent as per SPRAT, with BatMaps showing the Project Area outside of the current, possible, and previous distribution (BatMaps, 2024). Suitable foraging and dispersal habitat is supported by the Project Area. As per the DCCEEW National Flying-fox monitoring viewer, four camps occur in proximity to the Project Area. However, only little red flying-fox has been recorded at these locations. One unconfirmed ALA record dated 1996 occurs within the desktop search extent, located south of the Project Area. A second ALA record from 1980 occurs approximately 16 km south of the Project Area near the Theodore Airport, however has a 22,000 m spatial uncertainty. With the exception of the two aforementioned records, no records occur in the wider region.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Reptiles			
Collared delma *Delma torquata*	Vulnerable	The collared delma is endemic to QLD and known from five sites including the Bunya Mountains, Blackdown Tablelands National Park, Expedition National Park, Western Creek near Millmerran and the Toowoomba Range. The species normally inhabits eucalypt-dominated woodlands and open-forests in QLD RE Land Zones 3, 9, and 10. The presence of rocks, logs, bark and other coarse woody debris, and mats of leaf litter (typically 30–100 mm thick) appears to be an essential characteristic of the collared delma microhabitat and is always present where the species occurs.	**Low** The Project Area occurs within the species 'may occur' distribution extent as per SPRAT. The Project Area supports some suitable vegetation communities on suitable land zones (3 and 9); however, where assessed as part of field survey, habitat is mostly marginal given the high levels of fragmentation and disturbance from cattle resulting in reduced microhabitat and lack of native species. A high abundance of surface rocks in which it would shelter was absent. Given presence of microhabitat features being an essential characteristic of where collared delma occurs, the highly modified landscape of the Project Area is unlikely to provide habitat suitable for this species. Further, no ALA records occur within the desktop search extent or wider region. The nearest ALA record (dated 1997) occurs approximately 90 km east within Kroombit Tops National Park which is a different landscape to what the Project Area consists of.
Ornamental snake *Denisonia maculata*	Vulnerable	Lower-lying subtropical areas with deep-cracking clay soils and adjacent slightly elevated ground of clayey and sandy loams, is the preferred habitat for this species. The species is also found in vegetation of woodland and shrub land, including some Brigalow *Acacia harpophylla*, and also riverside woodland and open forest, particularly on natural levees.	**Known** This species has been recorded once within the northern Project Area, south of the Dawson Highway in an area supporting extensive gilgai and regrowth brigalow. Preferred habitat in the form of brigalow woodlands, gilgai and riparian woodlands occurs across the Project Area.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Yakka skink *Egernia rugosa*	Vulnerable	Variety of drier forests and woodlands, usually on well-drained, gritty soils, including poplar box *Eucalyptus populnea* on alluvial soils, white cypress pine *Callitris glaucophylla* on sands, bull oak *Allocasuarina luehmannii*, brigalow *Acacia harpophylla*, bendee *Acacia catenulata* and mulga *Acacia aneura*. Lives in burrows, abandoned rabbit warrens, and hollow logs or in deep rock crevices. An extremely secretive species; its presence is often indicated by scats near its shelter sites.	**Moderate** The Project Area occurs primarily within the species 'may occur' distribution extent. The far north-eastern extent of the Project Area occurs within the species 'like to occur' extent. Potentially suitable woodland habitat occurs within the Project Area. However, habitat surveyed to date is marginally suitable due to the hard clay-based soils (unsuitable for burrows) and lacking refuge microhabitat. No potential burrow sites or latrines have been detected. One ALA record from 1975 occurs within the desktop search extent, located to the north-east, close to the locality of Banana (the nearest 'likely to occur' area). The record is associated with OZCAM and the location has been generalised by 2 km. However, as the GPS location provided is not precise (-24.5, 150.1) it is therefore considered likely that the spatial uncertainty is greater. The next nearest record (dated 1955) is located approximately 47 km to the north-east. It is noted that other than these two records, no records of the species occur within the wider region. The species was not detected during surveys for any of the other identified projects in the region that have been referred in the last decade, including the Banana Range Wind Farm, which occur closer to areas of 'likely to occur' distribution. Noting this, it is considered possible that the species has become locally extinct, given the extensive agricultural development that has occurred and the detrimental biological characteristics of the species including high site fidelity and low fecundity. However, to ensure a conservative approach to future assessments the species has been determined to have a moderate likelihood of occurrence.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
White-throated snapping turtle *Elseya albagula*	Critically Endangered	The white-throated snapping turtle is only found in the Burnett, Fitzroy, Raglan and Mary River drainages of south-east QLD. It prefers permanent flowing water habitats where there are suitable shelters and refuge.	**High** The Project Area occurs primarily within the species 'may occur' distribution extent. The Dawson River, primarily located within the western extent of the Project Area, occurs within the species 'like to occur' extent. Suitable habitat for the species within the Project Area is limited to the Dawson River, with all other watercourses very narrow and ephemeral. Three ALA records occur within the desktop search extent, including one from 2009 (OZCAM) which occurs within the south-western Project Area along the Dawson River. Both of the other records identified are also associated with the Dawson River, dated 2002 and 2007.
Dunmall's snake *Furina dunmalli*	Vulnerable	The distribution of Dunmall's snake extends from near the QLD border throughout the Brigalow Belt South and Nandewar bioregions, as far south as Ashford in NSW. Records indicate sites at elevations between 200–500 m ASL. The snake is very rare or secretive with limited records existing. It has been recorded at Archokoora, Oakey, Miles, Glenmorgan, Wallaville, Gladstone, Lake Broadwater, Mount Archer, Exhibition Range National Park, roadside reserves between Inglewood and Texas, Rosedale, Yeppoon and Lake Broadwater Conservation Park. The species has been found in a broad range of habitats, including forests and woodlands on black alluvial cracking clay/ clay loams dominated by *Acacia harpophylla* and other *Acacia* spp., *Callitris* spp. or *Allocasuarina luehmannii*, and various *Corymbia citriodora*, *Eucalyptus crebra*, *E. melanophloia* and *Callitris glaucophylla* open forest and woodland associations on sandstone derived soils.	**Low** The Project Area occurs within the species 'may occur' distribution extent. Some potential habitat occurs within the Project Area including woodlands dominated by *Eucalyptus* and *Acacia*, however habitat is likely to only be marginally suitable as soils in locations surveyed to date are generally heavy clays. No sandstone derived soils are mapped. Whilst it is acknowledged that the species is highly elusive, the general characteristics of the Project Area doesn't contain large areas of open forests and woodlands that would host a high abundance of microhabitat features such as fallen timber in which it would shelter. No ALA records occur within the desktop search extent or the wider local area. The nearest ALA record occurs approximately 44 km to the south-west (dated 2002 and associated with OZCAM).
Grey snake*Hemiaspis damelii*	Species listed as Endangered under EPBC Act on 5 October 2022 (after referral decision date). No assessment required.		

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Fitzroy River turtle *Rheodytes leukops*	Vulnerable	Occurs in flowing rivers with large deep pools with rocky, gravelly or sandy substrates, connected by shallow riffles. It is a benthic feeder whose diet consists of insects, macro-invertebrates, crustaceans, algae, gastropods, worms, freshwater sponges and aquatic plants. Preferred areas have high water clarity and are often associated with ribbonweed (*Vallisneria* sp.) beds. Common riparian vegetation includes blue gums *(Eucalyptus tereticornis*), river oaks (*Casuarina cunninghamiana*), weeping bottlebrushes (*Melaleuca viminalis*) and paperbarks (*Melaleuca linariifolia*).	**High** The Project Area occurs primarily within the species 'likely to occur' distribution extent. Suitable habitat for the species within the Project Area is limited to the Dawson River where deep permanent pools occur, with all other watercourses very narrow and ephemeral in nature (unlikely to be suitable). One ALA record from 2009 occurs within the desktop search extent, associated with the Dawson River. However, Due to sensitivity concerns, the coordinates of this record have been generalised (generalised to 2 km by QLD DEHP). An additional record occurs approximately 25 km south-west (dates 2000 and general record to 2 km). It should be noted that majority of species records occur north (approximately 50 km) in association with the Fitzroy River.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Snail			
Boggomoss snail *Adclarkia dawsonensis*	Critically Endangered	The species is only known from two sites on the Dawson River in south-eastern QLD. One is on Boggomoss habitat on the Dawson River near Taroom (private property) and the other in a stock and water reserve at the Isla-Delusion crossing. As described in the species' Conservation Advice, the likelihood of boggomoss snails occurring elsewhere is low, as most of the suitable habitat in the area has been surveyed without any other evidence of occurrence of the snail being located. The snail appears restricted to alluvial flats and riparian environments between Taroom and Theodore. Habitat preferences for both macrohabitat and microhabitat are specific. The snail needs a moist environment and cannot live in open country. The preferred habitat is the floodplain of the Dawson River in places where there is good canopy cover, a moist environment, fallen logs and deep leaf litter. SPRAT identifies five REs to provide habitat for the species including RE 11.3.3, 11.3.4, 11.3.25, 11.3.27 and 11.3.36. The species is subject to a number of ongoing threats - changes to water flows in the Dawson River, drying out of Boggomoss habitat, fire, grazing, introduced weeds, timber collection and quarrying. Boggomoss snails have frail shells that suggest they may be particularly sensitive to habitat modification which exacerbates dryness.	**Moderate** The species is known from only six discrete locations between Taroom and Theodore, connected by the Dawson River. Only a portion of the far southern Project Area occurs within the species mapped 'may occur' distribution extent, which is north of the known population at the Isla-Delusion crossing. However, the Dawson River continues north and traverses the length of the western Project Area. The species is known to be highly sensitive to impacts that may result in altered hydrology. The Project Area has been subject to extensive land use change and broadscale clearing as evident on historical aerial imagery. Furthermore, two weirs occur along the Dawson immediately north-west of the Project Area (the Moura weir, completed in 1946) and immediately south of the Project Area (the Dawson River Weir, completed in 1930). These factors are likely to have resulted in reduced or altered surface water regimes in many places, potentially rendering habitat unsuitable or marginal in places that would have otherwise been suitable. Altered surface water flows, especially along the Dawson River, are also likely to have reduced the chances of flood events and recolonisation. Other threats such as grazing and weeds are also common across the Project Area. Potential habitat for the species within the Project Area is therefore confined to areas that align with the predicted distribution of the species. Four ALA records occur to the southeast of the Project Area near Theodore, ranging between 9-12 km away. Of these four records, the most recent and closest to the Project Area is dated 2009 and has a 500 m spatial uncertainty. As no survey effort specific to the species has occurred in Project Area, the precautionary principle has been applied, and the species has been presumed to occur in the far southern Project Area.

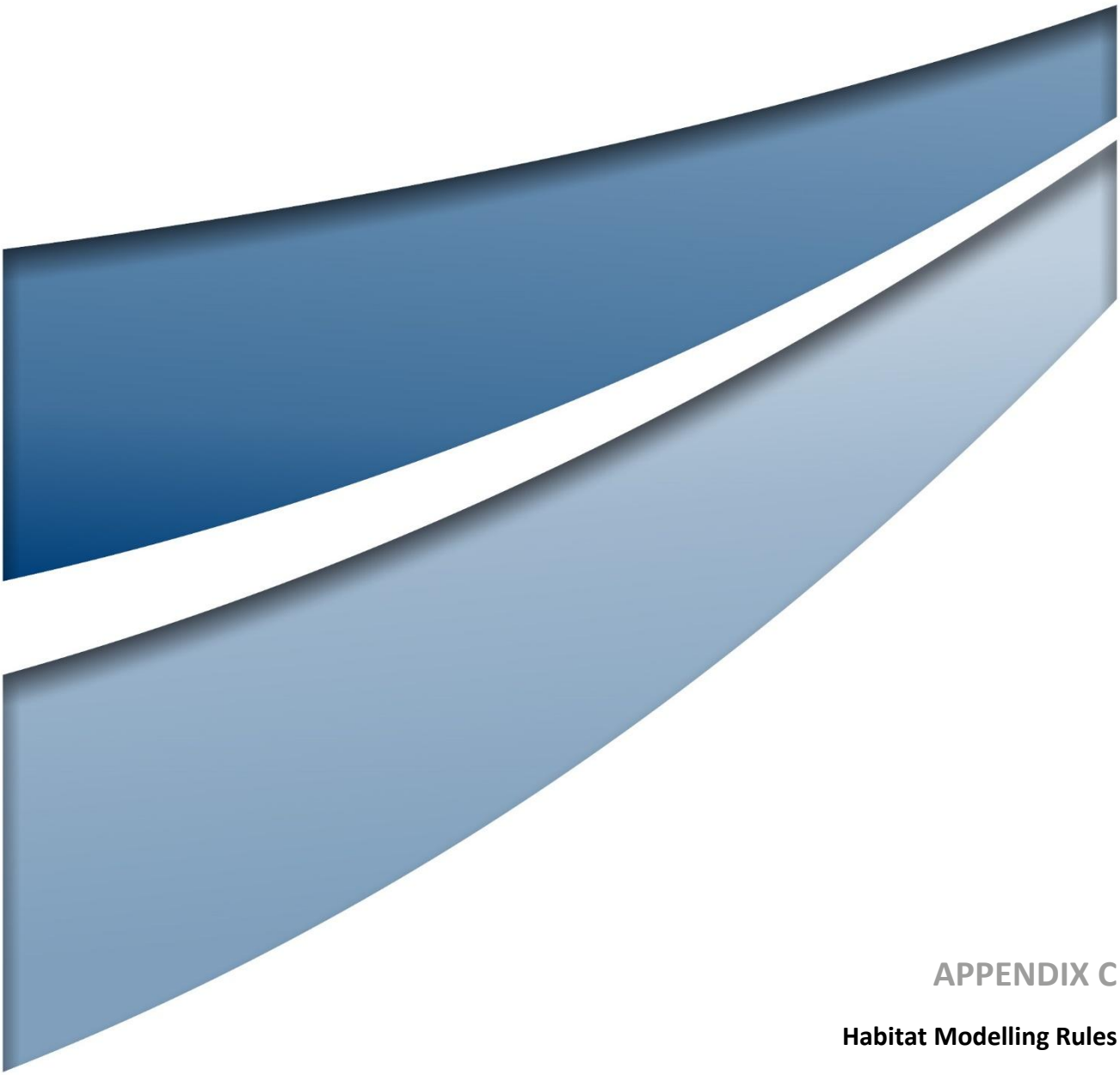
Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Migratory Species			
Migratory Marine Birds			
Fork-tailed swift *Apus pacificus*	Migratory	The fork-tailed swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher.	**High** The Project Area occurs within the species 'likely to occur' distribution extent as per SPRAT. However, this extent covers almost all of Australia. This species has broad habitat requirements given its aerial nature and only occurs in Australia during its non-breeding season. As such, the entire Project Area may provide suitable habitat. Two ALA records of the species occur within the desktop search extent (one undated and the other from 2007); both are located to the west of the Project Area with one in the township of Moura and the other along the Dawson River. According to eBird, the species may utilise the Project Area occasionally during its pre- and post-breeding migration to and from Australia (eBird, 2024). Suitable habitat exists throughout the Project Area.
Migratory Marine Species			
Salt-water crocodile *Crocodylus porosus*	Migratory	In QLD the salt-water crocodile inhabits reef, coastal and inland waterways from Gladstone on the east coast, throughout the Cape York Peninsula and west to the QLD-Northern Territory border. Studies from Arnhem Land (Northern Territory) indicated that the salt-water crocodile mostly occurs in tidal rivers, coastal floodplains and channels, billabongs and swamps up to 150 km inland from the coast. It usually inhabits the lower (estuarine) reaches of rivers. In QLD, the species is usually restricted to coastal waterways and floodplain wetlands.	**Low** The Project Area occurs >220 km inland from the coastline, and the species is not known from the Dawson River. No ALA records occur within the desktop search extent or wider region.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Migratory Terrestrial Species			
Oriental cuckoo *Cuculus optatus*	Migratory	The species uses a range of vegetated habitats such as monsoon rainforest, wet sclerophyll forest, open woodlands and appears quite often along edges of forests, or ecotones between forest types.	**Low** The Project Area occurs within the species 'may occur' distribution extent as per SPRAT. Some potentially suitable open woodland and forest habitat occurs within the Project Area. No ALA records occur within the desktop search extent. One undated ALA record is located approximately 15 km to the south of the Project Area, however it has a very high spatial uncertainty (108 km) likely attributable to the poor accuracy in the GPS location provided (-25, 150). Records in the region are rare, with the next closest record occurring approximately 50 km to the north-east (closer to their core distribution along the coast). This record is also undated and has a spatial uncertainty of 9000 m.
Yellow wagtail *Motacilla flava*	Migratory	The yellow wagtail is a regular wet season visitor to northern Australia. Habitat requirements for the yellow wagtail are highly variable, but typically include open grassy flats near water. Habitats include open areas with low vegetation such as grasslands, airstrips, pastures, sports fields; damp open areas such as muddy or grassy edges of wetlands, rivers, irrigated farmland, dams, waterholes; sewage farms, sometimes utilise tidal mudflats and edges of mangroves.	**Low** The Project Area occurs within the species 'may occur' distribution extent as per SPRAT. However, the Project Area does not occur near any of the known previous sighting locations. The species is considered 'extremely uncommon' as per the *Draft referral guideline for 14 birds listed as migratory under the EPBC Act* (Department of Environment, 2015). No ALA records occur within the desktop search extent or within the wider region. The nearest ALA record occurs approximately 96 km north near Duaringa and is dated 1905.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Migratory Wetland Species			
Common sandpiper *Actitis hypoleucos*	Migratory	Utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity. Is mostly found around muddy margins or rocky shores and rarely on mudflats. Has been recorded in estuaries and deltas of streams, as well as on banks further upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags.	**High** The Project Area overlaps with both an area of 'likely to occur' and 'may occur' distribution as per SPRAT. The 'likely to occur' area is located in the northern Project Area and associated with a section of the Dawson River south of the township of Moura. Suitable habitat may include the Dawson River, farm dams, lacustrine wetlands and palustrine wetlands. An ALA record from 2007 occurs within the desktop search extent, located immediately west of the Project Area near Moura. Records in the wider local area are otherwise scarce.
Sharp-tailed sandpiper *Calidris acuminata*	Migratory/ Vulnerable (as of Jan 2024)	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland. They also occur in salt works and sewage farms.	**Moderate** The Project Area occurs within the 'may occur' extent of the species distribution as per SPRAT. Farm dams, lacustrine wetlands and palustrine wetlands within the Project Area may provide suitable habitat for the species during periods of inundation. No ALA records occur within the desktop search extent. The nearest ALA record, dated 2000, occurs approximately 35 km to the south near the Dawson River.
Pectoral sandpiper *Calidris melanotos*	Migratory	Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	**Low** The Project Area occurs within the 'may occur' extent of the species distribution as per SPRAT. Farm dams, lacustrine wetlands and palustrine wetlands within the Project Area may provide suitable habitat for the species during periods of inundation. No ALA records occur within the desktop search extent or wider region. The nearest ALA record (undated) is located >150 km to the east near Boyne Island.

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Latham's snipe *Gallinago hardwickii*	Migratory/ Vulnerable (as of Jan 2024)	In Australia, the Latham's snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies).	**High** The Project Area occurs within the 'may occur' extent of the species distribution as per SPRAT. Farm dams, lacustrine wetlands and palustrine wetlands within the Project Area may provide suitable habitat for the species during periods of inundation. Two ALA records (dated 2008 and 2009) occur within the Project Area both within the township of Moura. One record (dated 2008) has a very high spatial uncertainty (23232 m) however the record details state Moura as the verbatim locality.
Caspian tern *Hydroprogne caspia*	Migratory	In QLD, the species is widespread in coastal regions from the southern Gulf of Carpentaria to the Torres Strait, and along the eastern coast. Recorded in the western districts, especially the Lake Eyre Drainage Basin, north-west to the Gulf Country north of Mt Isa and Cloncurry, there are also scattered records for central QLD. Breeding occurs on the Wellesley Islands, south-east Gulf of Carpentaria; islands off the far north coast, from Bird Island, south to Three Isles; and from islands around Shoalwater Bay. Inland breeding records occur at Lake Bindegolly and Lake Moondarra.	**Known** This species was recorded during the field survey program along the Dawson River, approximately 1 km west of the Project Area. The Dawson River and larger dams may provide suitable habitat.
Osprey *Pandion haliaetus*	Migratory	Favoured habitats are coastal areas, especially the mouths of large rivers, lagoons and lakes but also along the larger coastal rivers such as the Clarence where nesting occurs upriver of Grafton, NSW.	**Low** The Project Area overlaps both areas of 'likely to occur' and 'may occur' distribution as per SPRAT. Areas of 'likely to occur' distribution are primarily associated with the Dawson River. The species typically occurs in coastal areas however is known to utilise large rivers. Riparian vegetation associated with the Dawson River is likely to provide suitable habitat. No ALA records occur within the desktop search extent. The nearest ALA record occurs approximately 27 km to the north west along the Dawson River. This record is however undated and has a high spatial uncertainty (18 km).

Name	EPBC Act Status[11]	Preferred Habitat	Likelihood of Occurrence
Glossy ibis *Plegadis falcinellus*	Migratory	The glossy ibis is considered migratory and nomadic. Within Australia, the species moves in response to good rainfalls, expanding its range, however the core breeding areas used are within the Murray-Darling Basin region of NSW and Victoria, the Macquarie Marshes in NSW, and in southern QLD. The glossy ibis often moves north in autumn, then return south to the main breeding areas in spring and summer. Preferred habitat for foraging and breeding are freshwater marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons.	**Known** This species was recorded during the field survey program, at a farm dam approximately 700 m from the northern boundary of the Project Area.



APPENDIX C

Habitat Modelling Rules

The methodology for MNES habitat mapping is provided in **Section 4.4.2**. The criteria have been developed for TECs, and threatened and migratory species which are known to occur or have a high or moderate likelihood of occurring within the Project Area. This criterion is based on SPRAT, scientific literature and field data, which incorporates the use of habitat assessments data (which capture species specific microhabitat features) and vegetation mapping. The MNES habitat modelling utilises REs as a basis, but each polygon is then assessed for suitability as per habitat assessments and available species information.

It is anticipated that the MNES habitat mapping rules specified below be utilised in all ecology scout surveys undertaken for the Project in order to identify and map habitat to assess against the constraints hierarchy (refer to **Section 8.1**). It should be noted that the list of REs provided is not exhaustive, however, is based on the current understanding of the Project Area and REs. Should additional REs be ground-truthed during Project surveys, these should be assessed for capability in providing potential habitat for MNES as per the habitat definitions described.

Table C1 Habitat Mapping Criteria

Habitat Definition	Utilisation	Primary Reference/s	Key Criteria / Terms	Explanatory Notes
Brigalow (*Acacia harpophylla* dominant and co-dominant) ecological community (Brigalow TEC)				
The Brigalow ecological community is characterised by the presence of Brigalow (*Acacia harpophylla*) as one of the three most abundant tree species. Brigalow is usually either dominant in the tree layer or co-dominant with other species such as *Casuarina cristata* (Belah), other species of *Acacia*, or species of *Eucalyptus*. The ecological community has a considerable range of vegetation structure and composition united by a suite of species that tend to occur on acidic and salty clay soils.	-	*Approved Conservation Advice for the Brigalow (Acacia harpophylla dominant and co-dominant) ecological community* (Department of the Environment, 2013a).	The listed ecological community is limited to patches that meet the key diagnostic characteristics and condition thresholds outlined in the Conservation Advice (Department of the Environment, 2013a).	As described in the communities Approved Conservation Advice (Department of the Environment, 2013a), there are several additional considerations (Section 1.7.5, pg 7) that should be taken into account when applying the key diagnostic characteristics and condition thresholds. Judgement of whether an EPBC-protected ecological community is present at a particular site should focus on how an area meets the description, particularly the key diagnostic characteristics for the national ecological community. Areas that contain existing infrastructure are not part of the listed ecological community.
Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions (Coolibah TEC)				
The Coolibah ecological community represents occurrences of one type of semi-arid to humid subtropical woodland where *Eucalyptus coolabah* subsp. *coolabah* (Coolibah) and/or *Eucalyptus largiflorens* (Black Box) are the dominant canopy species and where the understorey tends to be grassy.	-	Commonwealth Listing Advice on Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions (Threatened Species Scientific Committee, 2011).	The listed ecological community is limited to patches that meet the description, key diagnostic characteristics and the condition thresholds outlined in the Commonwealth Listing Advice (Threatened Species Scientific Committee, 2011).	As described in the communities Listing Advice (Threatened Species Scientific Committee, 2011), there are several additional considerations (pg 9) that should be taken into account when applying the condition thresholds.

Habitat Definition	Utilisation	Primary Reference/s	Key Criteria / Terms	Explanatory Notes
Poplar Box Grassy Woodland on Alluvial Plains (Poplar Box TEC)				
The Poplar Box ecological community is typically a grassy woodland with a canopy dominated by *Eucalyptus populnea* and understorey mostly of grasses and other herbs. The ecological community mostly occurs in gently undulating to flat landscapes and occasionally on gentle slopes on a wide range of soil types of alluvial and depositional origin.	-	*Conservation Advice (including listing advice) for the Poplar Box Grassy Woodland on Alluvial Plains* (Department of the Environment and Energy, 2019).	The listed ecological community is limited to patches that meet the key diagnostic characteristics and condition thresholds outlined in the Conservation Advice (Department of the Environment and Energy, 2019).	As described in the communities Conservation Advice (Threatened Species Scientific Committee, 2011), the additional factors noted in Section 3.2.3 (pg 19) and critical areas noted in Section 3.3 (pg 16) also should be taken into consideration.
Xerothamnella herbacea				
Open forests and woodland habitats where brigalow (*Acacia harpophylla*) dominates or co-dominates on heavy soils. Often in leaf litter and is associated with gilgais.	Suitable habitat	*Approved Conservation Advice for Xerothamnella herbacea* (Department of the Environment Water Heritage and the Arts, 2008b).	-	Habitat requirements are supported by known records of the species across its distribution.
Any patch of vegetation confirmed via field survey to contain the species.	Known habitat			
Solanum dissectum				
Open forests and woodland habitat where brigalow (*Acacia harpophylla*) and/ or lapunyah (*Eucalyptus thozetiana*) characterise the dominant vegetation types on solodic clay soils.	Suitable habitat	*Conservation Advice Solanum dissectum* (Threatened Species Scientific Committee, 2016b).	-	Habitat requirements are supported by known records of the species across its distribution.
Any patch of vegetation confirmed via field survey to contain the species.	Known habitat			

Habitat Definition	Utilisation	Primary Reference/s	Key Criteria / Terms	Explanatory Notes
Solanum johnsonianum				
Open forest and woodland habitats where brigalow (*Acacia harpophylla*) dominates or co-dominates on heavy cracking clay soils. Other associated species include lapunyah (*Eucalyptus thozetiana*) with and understory of wilga (*Geijera parviflora*).	Suitable habitat	*Conservation Advice Solanum johnsonianum* (Threatened Species Scientific Committee, 2016d).	-	Habitat requirements are supported by known records of the species across its distribution.
Any patch of vegetation confirmed via field survey to contain the species.	Known habitat			
Ornamental snake (*Denisonia maculata*)				
Vegetation, generally comprising woodlands and open forests but also non-remnant areas associated with 'moist areas' (gilgai and depressions, undulating claypans, lake margins, wetlands and floodplains) that support key refuge microhabitat (i.e. network of soil cracks including deep cracks). Also includes fringing riparian vegetation along watercourses where substitute refuge microhabitat is supported (ground timber and exposed roots). Vegetation functionally connected to moist areas or watercourses that have low-levels, absent or 'impacted' refuge microhabitat may also be suitable if the areas provide temporary foraging opportunities (i.e. support frog habitat) and/or facilitate movement to other areas of suitable habitat.	Suitable habitat	*Approved Conservation Advice for Denisonia maculata (Ornamental Snake)* (Threatened Species Scientific Committee, 2014a) and *Denisonia maculata* in Species Profile and Threats Database (SPRAT) (Department of the Environment, 2025).	Moist areas are defined as environments that generally support ponds of surface water for extended periods. During the dry season, the presence of wetland indicator species may be used to make this assessment. Impacted microhabitat includes soil cracks that are compromised by high levels of exotic vegetation incursion (i.e. high biomass grass incursion or weed species) or cattle grazing activities (which would compact soil cracks and breakdown timber). Movement of individuals is not facilitated if vegetation contains hard	The ornamental snake can be found on floodplains, undulating clay pans and along the margins of swamps, lakes and watercourses. It also occurs on adjoining areas of elevated ground and has been recorded in woodlands and open woodlands of coolabah, poplar box, and brigalow, and in fringing vegetation along watercourses (WWF-Australia/QMDC, 2008 in Threatened Species Scientific Committee, 2014a). They feed almost exclusively on frogs (Threatened Species Scientific Committee, 2014a) and therefore only persist in areas that support habitat for frogs too. As described on the species SPRAT profile (2025), ornamental snakes are nocturnally active, sheltering during the day under fallen timber, rocks, bark and in deep soil cracks. The species is probably active year round with the exception of the cooler months, with peak activity likely to be early summer through to the wet season. During dry times the snake can remain inactive in suitable shelter sites for months (Agnew 2010 pers. comm.; DSEWPaC 2011m; Shine 1983). The species is ground-dwelling and not known to utilise trees at any time.
Vegetation that is not associated with or connected to 'moist areas' (gilgai and depressions, undulating claypans, lake margins, wetlands and floodplains). Frog habitat is not supported, **and** area **does not** facilitate movement to other areas of suitable habitat.	Not habitat			

Habitat Definition	Utilisation	Primary Reference/s	Key Criteria / Terms	Explanatory Notes
This includes vegetation that has been subject to recent land use change or earthworks (i.e. cropping, tilling or ploughing).			barriers in the ground layer that are not easily navigated, or is associated with watercourses/drainage lines with very steep banks including severely eroded or undercut.	
Koala (*Phascolarctos cinereus*)				
Eucalypt forests or woodlands on alluvial associated with permanent water features (dams, wetlands and/or watercourses) that are resilient to drying conditions, likely to provide a cooler refuge during periods of bushfire and heatwaves.	Climate refugia	Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory (Department of Agriculture Water and the Environment, 2022c) and A review of koala habitat assessment criteria and methods (Youngentob, Marsh and Skewes, 2021).	Brigalow Belt Locally important koala tree species as listed in Table 3, pg 42, of Youngentob, Marsh and Skewes (2021). Brigalow Belt Ancillary habitat tree species as listed in Table 4, pg 43, of Youngentob, Marsh and Skewes (2021).	Koalas may survive in refuge areas where microclimates such as deep gullies, caves, cliffs or dense vegetation provide refuge from heat, and perennial water results in leaf-water content remaining high (Runge et al. 2021a in Department of Agriculture Water and the Environment, 2022b). Surface water availability may be an important ancillary habitat element of refugia (Youngentob, Marsh and Skewes, 2021).
Any forest or woodland that contains Brigalow Belt 'locally important koala trees' (LIKTs, as described by Youngentob, Marsh and Skewes, (2021)) that is not climate refugia.	Breeding and foraging			Koalas are tree-dwelling, obligate folivores (leaf eaters) with a highly specialised diet. The koala's diet is defined by the availability and palatability of a limited variety of *Eucalyptus*, *Corymbia* and *Angophora* species (Department of Agriculture Water and the Environment, 2022c). Koala browsing preferences show regional differences which are influenced by the chemical profiles and water content of different target food leaves. In the Youngentob, Marsh and Skewes (2021) document, region-specific, locally important koala tree species that can be used as a starting point to determine whether an area could be habitat for the EPBC Act-listed koala, are identified.

Habitat Definition	Utilisation	Primary Reference/s	Key Criteria / Terms	Explanatory Notes
Any forest or woodland community which does not contain LIKTs and may or may not contain Brigalow Belt 'ancillary habitat trees' (as described by Youngentob, Marsh and Skewes, (2021)).	Shelter			Research suggests that koalas may seek out certain trees, including non-eucalypts, for specific thermal properties that provide shade or offer cooler or warmer surface temperatures to help the koala thermoregulate (Ellis et al. 2010 and Briscoe et al. 2014 in Youngentob, Marsh and Skewes, 2021). Patches of native forest or woodland can act as stepping stones and provide a corridor of connectivity between larger habitat patches (Youngentob, Marsh and Skewes, 2021). In describing ancillary habitat trees, Youngentob, Marsh and Skewes (2021) state "[a]lthough, these species do not constitute habitat in the absence of LIKT, they are thought to make an important and potentially necessary contribution to koala habitat in many regions. For this reason, we have also included a separate table for each KMB (region) that includes ancillary habitat trees that are unlikely to be preferred browse trees, but are likely to make important contributions to koala habitat based on documented koala use in peer-reviewed literature, SEPP (SEPP 2021), and/or direct feedback (Appendix A)".
Vegetation that provides a safe intervening ground for the species to move across the landscape (i.e. free from impediments), particularly to and from areas of potential breeding and foraging habitat. This includes non-remnant shrublands and grasslands, which generally support sporadic small stands of trees and/or individual paddock trees. Excludes areas containing infrastructure, active mining areas, cropping, farm dams and other water bodies as	Dispersal		Impediment is defined as a natural or artificial landscape feature that interferes with the safe movement of koalas across a landscape, such as roadways (Youngentob, Marsh and Skewes, 2021). When defining a patch of dispersal habitat, the immediate area/s	Scattered trees can provide essential shelter and food to help koalas move more safely for longer distances across the landscape during dispersal. Walking on the ground is how koalas typically travel between trees, so the ground itself forms an essential component of koala habitat, without which movement between trees would be hindered or impossible (Youngentob, Marsh and Skewes, 2021). The safety or hostility of this matrix also contributes to the overall quality of habitat (Department of Agriculture Water and the Environment, 2022d).

Habitat Definition	Utilisation	Primary Reference/s	Key Criteria / Terms	Explanatory Notes
well as areas that are physically inaccessible (e.g. exclusion fencing is present).			comprising the impediment should be excluded.	
Painted honeyeater (*Grantiella picta*)				
Woodlands, forests and riparian woodlands dominated by species from the genera *Eucalyptus*, *Acacia*, *Melaleuca*, *Casuarina* and/or *Callitris*, that support mistletoe.	Foraging and dispersal	*Conservation Advice Grantiella picta painted honeyeater* (Threatened Species Scientific Committee, 2015b) and *National Recovery Plan for the Painted Honeyeater (Grantiella picta)* (Department of Agriculture, Water and the Environment, 2021).	-	The greatest concentrations and almost all records of painted honeyeater breeding come from south of 26°S, on inland slopes of the Great Dividing Range between the Grampians, Victoria and Roma, Queensland (Higgins et al. 2001 in Department of Agriculture, Water and the Environment, 2021). The Project Area occurs between 24°30' degrees and 24°40' degrees. As such, all areas of potential habitat that are subsequently confirmed to contain mistletoe are considered suitable for foraging and dispersal purposes only.
Squatter pigeon (southern) (*Geophaps scripta scripta*)				
Any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species, on sandy, gravelly or loamy soils with patchy perennial tussock grasses or a mix of perennial tussock grasses and low shrubs and forbs (including but not limited to areas mapped as Queensland land zones 3, 5 or 7) and within 1 km of a permanent or seasonal water source with gently sloping banks.	Breeding	*Conservation Advice Geophaps scripta scripta squatter pigeon (southern)* (Threatened Species Scientific Committee, 2015a) and *Geophaps scripta scripta in Species Profile and Threats Database* (SPRAT) (Department of the Environment, 2025).	Water sources include farm dams, lacustrine wetlands and watercourses with a stream order of 2 or higher.	The subspecies' SPRAT (2025) profile states: Soil landscapes are good indicators of where natural, foraging and breeding habitats for the subspecies occur (Squatter Pigeon Workshop 2011). Well-draining, gravelly, sandy or loamy soils support the open-forest to woodland communities with patchy, tussock-grassy understories that support the subspecies' foraging and breeding requirements. Breeding habitat and foraging habitat occurs within 1 km and 3 km of a suitable waterbody respectively (Squatter Pigeon Workshop 2011). The Squatter Pigeon (southern) is known to access suitable waterbodies to drink on a daily basis. The subspecies prefers to drink where
Any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species, on sandy, gravelly or loamy soils with patchy perennial tussock grasses or a mix of perennial tussock grasses and low shrubs and forbs (including but not limited to areas mapped as	Foraging			

Habitat Definition	Utilisation	Primary Reference/s	Key Criteria / Terms	Explanatory Notes
Queensland land zones 3, 5 or 7) and within 3 km of a permanent or seasonal water source with gently sloping banks.				there is gently sloping, bare ground on which to approach and stand at the water's edge. Where scattered trees still occur, and the distance of cleared land between remnant trees or patches of habitat does not exceed 100 m, individuals may be found foraging in, or moving across modified or degraded environments (Squatter Pigeon Workshop 2011).
Any forest or woodland occurring between patches of breeding or foraging habitat that facilitates movement between patches of breeding habitat, foraging habitat and/or water sources, and areas of cleared land with scattered trees less than 100 m wide linking areas of suitable breeding and/or foraging habitat.	Dispersal			
Greater glider (southern and central) (*Petauroides volans*)				
Eucalypt forests and woodlands (patches or corridors ≥3 ha) that support potential hollow-bearing trees, comprising habitat or potential habitat regional ecosystems (REs), OR REs dominated or co-dominated by the primary associated canopy species (listed below) as per Eyre, Smith, et al. (2022). Eucalypt forests and woodlands that support potential hollow bearing trees but do not align with an RE (i.e. non-remnant communities) may also comprise habitat where dominated by *Corymbia intermedia*, *Corymbia citriodora*, *Eucalyptus tereticornis*, *Eucalyptus portuensis*, *Eucalyptus moluccana* and/or *Eucalyptus crebra*.	Denning	Conservation Advice for Petauroides volans (greater glider (southern and central)) (Department of Climate Change, Energy, the Environment and Water, 2022a) and the *Guide to greater glider habitat in Queensland* (Eyre, Smith, *et al.*, 2022).	Potential hollow-bearing trees refers to both live and dead trees of any genera that are ≥30 cm DBH (Department of Climate Change, Energy, the Environment and Water, 2022a). Habitat and potential habitat REs are those determined by (Eyre, Smith, *et al.*, 2022). A corridor refers to a series of habitat patches (any combination of 'denning' and 'foraging and dispersal' patches) that are separated by distances the species is capable of gliding across, based on its glide angle (40°) and the height of the vegetation. In	The greater glider (southern and central) is largely restricted to eucalypt forests and woodlands of eastern Australia (Department of Climate Change, Energy, the Environment and Water, 2022a). The *Guide to greater glider habitat in Queensland* (Eyre, Smith, *et al.*, 2022) provides a detailed assessment of the species' habitat requirements in QLD specifically, based on quantitative and qualitative data including expert opinion. As detailed in the guide, habitat and potential habitat was categorised using the QLD RE framework. From this, six tree species were identified as dominant or co-dominant species to the majority of greater glider habitat. They use gliding locomotion to move between trees and are dependent on tree cover for movement through their home ranges. Wakefield (1970) states that the glide angle for this species is approximately 40° based on extensive field observations. The species is known to be very clumsy when moving along the ground and highly vulnerable to terrestrial predators (Fleay 1947), suggesting there is a strong preference to land on a tree trunk. Noting this, the glide angle and other factors (such as the fact that
Eucalypt forests and woodlands (patches or corridors ≥3 ha) with a canopy height >10 m that do not support potential hollow-bearing trees, comprising habitat or potential habitat regional ecosystems (REs), OR REs dominated or co-dominated by the primary associated canopy species (listed below) as per Eyre, Smith, et al. (2022). Eucalypt forests and woodlands that do not align with an RE (i.e. non-remnant	Foraging and dispersal			

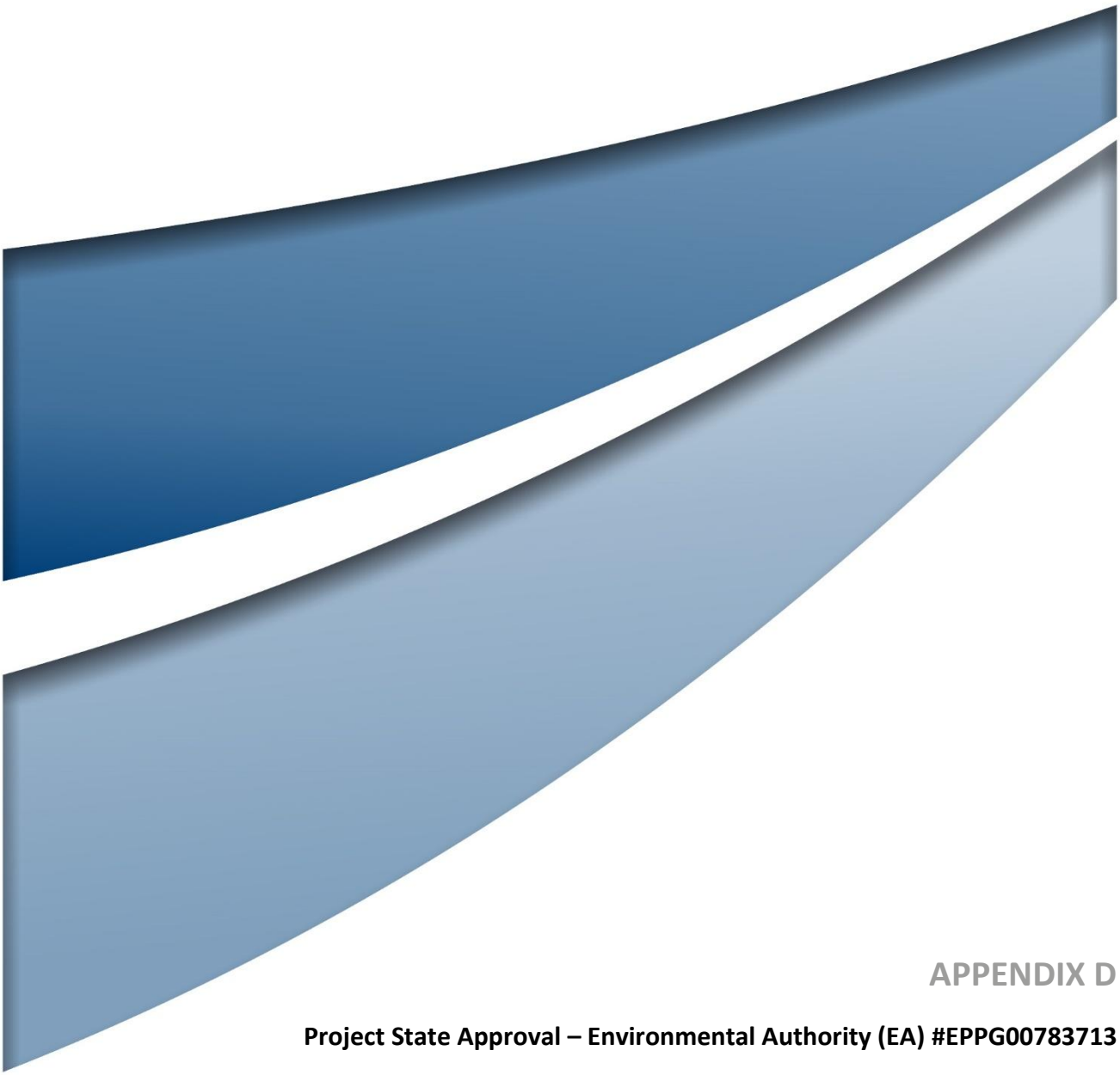
Habitat Definition	Utilisation	Primary Reference/s	Key Criteria / Terms	Explanatory Notes
communities) may also comprise habitat where dominated by *Corymbia intermedia*, *Corymbia citriodora*, *Eucalyptus tereticornis*, *Eucalyptus portuensis*, *Eucalyptus moluccana* and/or *Eucalyptus crebra*. Foraging and dispersal habitat (individual patch or corridor) must occur within gliding distance (calculated based on known glide angle and tree height, or 100 m if not able to calculate accurately) of denning habitat, given the species' reliance on hollow-bearing trees to shelter during the day.			determining if a corridor is present, potential habitat outside of the Project Area must be considered. Where these areas cannot be field validated, the precautionary principle should apply.	launch points are unlikely to be the very top of the tree), low woodlands (i.e. canopy 10 m or less) do not facilitate movement. During the day the species shelters in tree hollows, with a particular preference for large hollows (diameter >10 cm) in large, old trees. Multiple dens are used by an individual. Tree hollows can be difficult to detect in ground-based surveys. The presence of trees with diameter at breast height >30 cm can be used as a proxy measure for tree hollows used by greater gliders in Queensland (Eyre et al. 2021 in Department of Climate Change, Energy, the Environment and Water, 2022a). Patch size is likely to influence greater glider occupancy of habitat. Simulations suggest that habitat patches as small as 3 ha can contribute to the persistence of greater gliders, depending on the characteristics of landscape context (McCarthy and Lindenmayer 1999 in Eyre *et al.*, 2022). Individual home ranges are typically relatively small (1–4 ha) but may reach up to 11 ha in hollow-limited environments (Smith et al. 2007). Greater gliders have been found in habitat patches <10 ha in some fragmented and remnant forest patches in the southern part of their geographic range (Pope et al. 2004; Lindenmayer 2002), but may require larger habitat patches in Queensland (Eyre 2006). As such, a minimum patch/corridor size of 3 ha has been considered appropriate given field survey data indicates the majority of the Project Area is a hollow-limited environment (the only exception being the Dawson River riparian zone).

Habitat Definition	Utilisation	Primary Reference/s	Key Criteria / Terms	Explanatory Notes
Yellow-bellied glider (south-eastern) (*Petaurus australis australis*)				
Floristically diverse, mature eucalypt woodlands and forests dominated by smooth-barks or half-barks, comprising patches or corridors ≥50 ha, that may support (now or in the future) large hollow-bearing trees.	Denning, foraging and dispersal	*Conservation Advice for Petaurus australis australis (yellow-bellied glider (south-eastern))* (Department of Agriculture Water and the Environment, 2022a).	A corridor refers to a series of patches that are separated by distances the subspecies is capable of gliding across, based on it's glide ratio (2:1) and the height of the vegetation. In determining if a corridor is present, potential habitat outside of the Project Area must be considered. Where these areas cannot be field validated, the precautionary principle should apply.	The subspecies has specific habitat requirements and occupies a large and exclusive home range of approximately 50-65 ha. Due to these large home ranges, large areas of forests are required to maintain subpopulation viability (Department of Agriculture Water and the Environment, 2022a). The subspecies has very low dispersal capabilities over spaces larger than its gliding distance. Management should be informed by average gliding performance (25.2 m), and it is suggested a glide ratio (horizontal distance/height dropped) of 2.0 should be used to estimate gliding distance (Goldingay 2014 in Department of Agriculture Water and the Environment, 2022a). There is no evidence that indicates the subspecies may utilise other vegetation communities or habitat types for any part of their life-cycle including dispersal. Smooth-barked eucalypts are important due to the range of foraging substrates (and therefore food resources) they provide. They also require some level of floristic diversity to provide a year-round food supply, and they are unlikely to persist in forests dominated by only one or two tree species (Kavanagh 1987a in Department of Agriculture Water and the Environment, 2022a). During the day, they shelter in hollows found in large, old trees, usually more than one metre in diameter (Kambouris et al. 2013).
White-throated snapping turtle (*Elseya albagula*) and Fitzroy River turtle (*Rheodytes leukops*)				
Permanent waters of rivers and streams with deep pools that may be permanently or periodically inter-connected by shallow riffles.	Breeding and foraging	*Conservation Advice Elseya albagula White-throated snapping turtle* (Threatened Species	-	Though both species are apparently capable of moving across relatively short distances of dry riverine habitat at least in seasonally favourable conditions (e.g. during rainy weather), neither

Habitat Definition	Utilisation	Primary Reference/s	Key Criteria / Terms	Explanatory Notes
		Scientific Committee, 2014b), *National Recovery Plan for the White Throated Snapping Turtle* (Department of Agriculture, Water and the Environment, 2020) and *Conservation Advice for Rheodytes leukops (Fitzroy River turtle)* (Department of Climate Change Energy the Environment and Water, 2024a).		species is known to use ephemeral, non-flowing lacustrine habitat such as swamps and billabongs, or farm dams (Hamann et al. 2007 and Limpus et al. 2011a in GHD, 2016).
White-throated needletail (*Hirundapus caudacutus*)				
Includes a range of habitats, although more often over wooded areas, where it is almost exclusively aerial.	Foraging and dispersal	*Conservation Advice Hirundapus caudacutus White-throated Needletail* (Threatened Species Scientific Committee, 2019) and *Draft referral guideline for 14 birds listed as migratory species under the EPBC Act* (Department of the Environment, 2015).	-	The species does not breed in Australia. Although they occur over most types of habitat, they are recorded most often above wooded areas, including open forest and rainforest, and may also fly below the canopy between trees or in clearings (Higgins 1999 in Threatened Species Scientific Committee, 2019).
Australian painted snipe (*Rostratula australis*)				
Shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use other 'moist areas' such as inundated or waterlogged grasslands (including those that	Seasonal breeding, foraging	*Approved Conservation Advice for Rostratula australis (Australian painted snipe)* (Department of	Moist areas are defined as environments that generally support ponds of surface water for extended periods. During	Due to the highly secretive behaviour and concealing habitats commonly used, the specific habitat requirements of the Australian Painted Snipe are much less well known than for most other Australian waterbirds (Department of Climate Change, Energy,

Habitat Definition	Utilisation	Primary Reference/s	Key Criteria / Terms	Explanatory Notes
support gilgai), saltmarsh, dams, rice crops, sewage farms and bore drains. Dominant vegetation in occupied wetlands may include one of more of these elements: grass (e.g. canegrass *Eragrostis australasica*), sedge, and nardoo (*Marsilea*), in sward or tussock form; clumps of rushes or reeds; samphire dwarf shrubland; and open-shrubland of lignum (*Duma* spp.), river cooba (belalie) *Acacia stenophylla*.	and dispersal	Sustainability Environment Water Population and Communities, 2013) and *National Recovery Plan for the Australian Painted Snipe* (Rostratula australis) (Department of Climate Change, Energy, the Environment and Water, 2022b).	the dry season, the presence of wetland indicator species may be used to make this assessment.	the Environment and Water, 2022b). The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. It can use modified habitats that are flooded, such as low-lying woodlands converted to grazing pasture, rice farms, sewage farms, dams, bores and irrigation schemes (Marchant and Higgins 1993 in Department of Climate Change, Energy, the Environment and Water, 2022b). Nest records are all, or nearly all, from or near small islands in freshwater wetlands, with a combination of very shallow water, exposed mud, dense low cover and sometimes some tall dense cover (Rogers et al. 2005 in (Department of Climate Change, Energy, the Environment and Water, 2022b).
Yakka skink (*Egernia rugosa*)				
Dry sclerophyll forests, woodlands and scrub that support suitable refuge microhabitat including but not limited to, large hollow logs, cavities or burrows under large fallen trees, tree stumps, logs, stick-raked piles, large rocks and rock piles, dense ground-covering vegetation, and deeply eroded gullies, rabbit warrens, tunnels and sinkholes.	Breeding and foraging	*Approved Conservation Advice for Egernia rugosa (Yakka Skink)* (Department of the Environment, 2014) and *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (Department of Climate Change, Energy, the Environment and Water, 2023a).	-	Colonies of presumably related individuals share a system of burrows dug under or between partly buried rocks or logs (especially very large logs, if available), into old root tracts or at the base of large trees or stumps (QMDC 2008 in Department of Sustainability, Environment, Water, 2011). They may also utilise old rabbit warrens, deep gullies and tunnel erosion and sinkholes. Burrows around artificial structures such as under sheds, loading ramps and stick-raked piles are also common. Ehmann (1992) and Wilson and Knowles (1987) report that the yakka skink, like several related species, has communal defecation sites near permanent burrows. They are extremely secretive and seldom venture far from shelter sites, where they retreat to at the first sign of disturbance (Department of the Environment, 2014). Searching
Any patch of potential breeding and foraging habitat (as described above) that has been subject to field assessment (effort appropriate to site size and inclusive of targeted yakka skink search transects / diurnal searches) and determined to not contain any potential burrows or latrine sites.	Not habitat		Latrine sites refer to communal defection sites. Should there be any uncertainty, photo vouchers including burrows (macro and microhabitat) and latrine sites, should be forwarded to the	

Habitat Definition	Utilisation	Primary Reference/s	Key Criteria / Terms	Explanatory Notes
			Queensland museum for positive identification and databasing of the record (Department of Sustainability, Environment, Water, 2011).	for burrow systems and communal defecation sites is the most reliable method of detection. Given the yakka skink's longevity (up to 20 years), low fecundity (2-5 years to sexual maturity), high site-fidelity, and that populations are highly fragmented, this species may be prone to localised extinctions (Department of Climate Change, Energy, the Environment and Water, 2023a).
Boggomoss snail (*Adclarkia dawsonensis*)				
Riparian woodlands and forest, monospecific stands of Carnarvon fan palm *Livistona nitida*, open forest fringing ephemeral wetlands on the Dawson River floodplain and artesian mound springs, that support microhabitat including partially buried logs in moist conditions and accumulated leaf litter (including palm fronds) AND occur within the species predicted distribution. Riparian/floodplain woodlands and forests must comprise a 'suitable regional ecosystem (RE)'.	Breeding and foraging	*Recovery plan for the boggomoss snail Adclarkia dawsonensis* (Department of Environment and Heritage Protection, 2017) and *Adclarkia dawsonensis in Species Profile and Threats Database* (SPRAT) (Department of the Environment, 2025b). There is no approved Conservation Advice for this species.	The species predicted distribution extent is based on the DCCEEW Species of National Significance (SNES) dataset (2024). Distributions are conservative as they have been generalised to a 1 km grid resolution (0.01°) (or ~10 km for species classed as sensitive by respective States and Territories). Suitable REs (SPRAT, 2025) include: 11.3.3, 11.3.4, 11.3.25, 11.3.27, 11.3.36.	The Boggomoss snail's geographic distribution is precarious for the survival of the species and is very restricted. The species is only known from two sites on the Dawson River in south-eastern Queensland. The likelihood of Boggomoss Snails occurring elsewhere is low, as most of the suitable habitat in the area has been surveyed without any other evidence of occurrence of the snail being located (Threatened Species Scientific Committee, 2003). The species SPRAT profile (2025) states that within the broad habitat types the species has been found in five REs as described under the Queensland Vegetation Management Framework, including RE 11.3.3, 11.3.4, 11.3.25, 11.3.27, 11.3.36. The boggomoss snail microhabitat has a critical requirement for deep, moist litter and fallen timber which provides food, shelter and egg-laying sites.



APPENDIX D

Project State Approval – Environmental Authority (EA) #EPPG00783713

Permit

Environmental Protection Act 1994

Environmental authority EPPG00783713

This environmental authority is issued by the administering authority under Chapter 5 of the Environmental Protection Act 1994.

Environmental authority number: EPPG00783713

Environmental authority takes effect on 20 December 2022

Environmental authority holder(s)

Name(s)	Registered address
Westside CSG D Pty Ltd	Level 17 300 Queen Street BRISBANE CITY QLD 4000
Westside CSG A Pty Ltd	Level 17 300 Queen Street BRISBANE CITY QLD 4000 Australia
Mitsui E&P Australia Pty Limited	Level 11, Exchange Tower, 2 The Esplanade PERTH WA 6000

Environmentally relevant activity and location details

Environmentally relevant activity/activities	Location(s)
Schedule 3 06: A petroleum activity carried out on a site containing a high hazard dam or a significant hazard dam	PL94
Schedule 3 08: A petroleum or GHG storage activity, other than items 1 to 7, that includes an activity from Schedule 2 with an AES	PL94
Ancillary 63 - Sewage Treatment 1: Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of (a-ii) 21 to 100EP otherwise	PL94

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Environmentally relevant activity/activities	Location(s)
Ancillary 15 - Fuel burning Using fuel burning equipment that is capable of burning at least 500kg of fuel in an hour	PL94

Additional information for applicants

Environmentally relevant activities

The description of any environmentally relevant activity (ERA) for which an environmental authority (EA) is issued is a restatement of the ERA as defined by legislation at the time the EA is issued. Where there is any inconsistency between that description of an ERA and the conditions stated by an EA as to the scale, intensity or manner of carrying out an ERA, the conditions prevail to the extent of the inconsistency.

An EA authorises the carrying out of an ERA and does not authorise any environmental harm unless a condition stated by the EA specifically authorises environmental harm.

A person carrying out an ERA must also be a registered suitable operator under the *Environmental Protection Act 1994* (EP Act).

Contaminated land

It is a requirement of the EP Act that an owner or occupier of contaminated land give written notice to the administering authority if they become aware of the following:

- the happening of an event involving a hazardous contaminant on the contaminated land (notice must be given within 24 hours); or
- a change in the condition of the contaminated land (notice must be given within 24 hours); or
- a notifiable activity (as defined in Schedule 3) having been carried out, or is being carried out, on the contaminated land (notice must be given within 20 business days);

that is causing, or is reasonably likely to cause, serious or material environmental harm.

For further information, including the form for giving written notice, refer to the Queensland Government website www.qld.gov.au, using the search term ‘duty to notify’.

Take effect

Please note that, in accordance with section 200 of the EP Act, an EA has effect:

a) if the authority is for a prescribed ERA and it states that it takes effect on the day nominated by the holder of the authority in a written notice given to the administering authority-on the nominated day; or

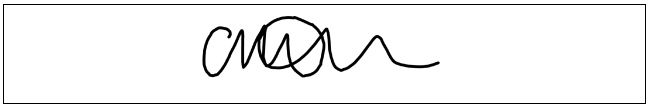
b) if the authority states a day or an event for it to take effect-on the stated day or when the stated event happens; or

c) otherwise-on the day the authority is issued.

However, if the EA is authorising an activity that requires an additional authorisation (a relevant tenure for a resource activity, a development permit under the *Sustainable Planning Act 2009* or an SDA Approval under the *State Development and Public Works Organisation Act 1971*), this EA will not take effect until the additional authorisation has taken effect.

If this EA takes effect when the additional authorisation takes effect, you must provide the administering authority written notice within 5 business days of receiving notification of the related additional authorisation taking effect.

If you have incorrectly claimed that an additional authorisation is not required, carrying out the ERA without the additional authorisation is not legal and could result in your prosecution for providing false or misleading information or operating without a valid environmental authority.



Signature

20 December 2022

Date

Clancy Mackaway
Department of Environment and Science
Delegate of the administering authority
Environmental Protection Act 1994

Enquiries:
Energy and Extractive Resources
Department of Environment and Science
Phone: 3330 5715
Email: energyandextractive@des.qld.gov.au

ABN 46 640 294 485

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Obligations under the *Environmental Protection Act 1994*

In addition to the requirements found in the conditions of this environmental authority, the holder must also meet their obligations under the EP Act, and the regulations made under the EP Act. For example, the holder must comply with the following provisions of the Act:

- general environmental duty (section 319)
- duty to notify environmental harm (section 320-320G)
- offence of causing serious or material environmental harm (sections 437-439)
- offence of causing environmental nuisance (section 440)
- offence of depositing prescribed water contaminants in waters and related matters (section 440ZG)
- offence to place contaminant where environmental harm or nuisance may be caused (section 443)

Conditions of environmental authority

Schedule A General

Schedule B Waste Management

Schedule C Protecting Acoustic Values

Schedule D Protecting Air Values

Schedule E Protecting Land Values

Schedule F Protecting Biodiversity Values

Schedule G Protecting Water Values

Schedule H Rehabilitation

Schedule I Well Construction, Maintenance and Stimulation Activities

Schedule J Structures

Schedule K Definitions

SCHEDULE A – GENERAL

Authorised Resource Activities

(A1) This environmental authority authorises the carrying out of the following resource activities:

a) the petroleum activities and specified relevant activities listed in *Schedule A, General, Table 1—Authorised Resource Activities* to the extent they are carried out in accordance with the activity's corresponding scale or intensity or both (where applicable); and

b) incidental activities that are not otherwise specified relevant activities.

(A2) The authorised resource activities are authorised subject to the conditions of this environmental authority.

(A3) This environmental authority does not authorise a relevant act to occur in carrying out an authorised resource activity unless a condition expressly authorises that relevant act to occur. Where there is no condition, the lack of a condition must not be construed as authorising the relevant act.

Schedule A, General, Table 1 – Authorised Resource Activities

Authorised Resource Activities	Scale		Intensity
	Maximum size	Location	
Petroleum activities			
Coal seam gas exploration and production	518ha	Within project area	600 wells
Specified relevant activities			
Stimulation activities	N/A	Within project area	600 wells
Operating fuel burning equipment (permanent, in isolation or combined in operation, or interconnected) that is capable of burning more than 500kg of fuel in an hour	15 ha across 7 compressor stations	Within project area	4200kg/hour (total)
Sewage treatment works, other than no-release works, where treated effluent is discharged from the works to an infiltration trench of through an irrigation scheme of otherwise discharged	100 EP per facility	Within project area	1 facility 1.25KL/day
Waste disposal onsite—operating a facility for disposing of greater than 50t of non-regulated waste in a year (mix-bury-cover where the drill muds do not have any substances that would make it a regulated waste)	Combined disposal capacity for waste less	Within project area	600 waste disposal locations

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	than 10000t/year		
Water treatment facility	10.36ha	Within project area	1 water treatment facility Less than 5ML/ day 3 brine storage tanks
Regulated Dam	2.73ha	Within project area	1 dam

Monitoring Standards

(A4) All monitoring must be undertaken by a suitably qualified person.

(A5) If requested by the administering authority in relation to investigating a complaint, monitoring must be commenced within 10 business days.

(A6) All laboratory analyses and tests must be undertaken by a laboratory that has NATA accreditation for such analyses and tests.

(A7) Notwithstanding condition (A6), where there are no NATA accredited laboratories for a specific analyte or substance, then duplicate samples must be sent to at least two separate laboratories for independent testing or evaluation.

(A8) Monitoring and sampling must be carried out in accordance with the requirements of the following documents (as relevant to the sampling being undertaken), as amended from time to time:

a) for waters and aquatic environments, the *Queensland Government's Monitoring and Sampling Manual 2009 – Environmental Protection (Water and Wetland Biodiversity) Policy 2019*

b) for groundwater, *Groundwater Sampling and Analysis – A Field Guide* (2009:27 GeoCat #6890.1)

c) for noise, the Environmental Protection Regulation 2019

d) for air, the *Queensland Air Quality Sampling Manual* and/or Australian Standard 4323.1:1995 *Stationary source emissions method 1: Selection of sampling positions*, as appropriate for the relevant measurement

e) for soil, the *Guidelines for Surveying Soil and Land Resources, 2nd edition* (McKenzie *et al.* 2008), and/or the *Australian Soil and Land Survey Handbook, 3rd edition* (National Committee on Soil and Terrain, 2009); and

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f) for dust, Australian Standard AS3580.

Notification

(A9) In addition to the requirements under Chapter 7, Part 1, Division 2 of the *Environmental Protection Act 1994*, the administering authority must be notified through the Pollution Hotline and in writing, as soon as possible, but within 48 hours of becoming aware of any of the following events:

a) any unauthorised significant disturbance to land

b) potential or actual loss of structural or hydraulic integrity of a dam

c) when the level of the contents of any regulated dam reaches the mandatory reporting level

d) when a regulated dam will not have available storage to meet the design storage allowance (DSA) on 1 November of any year

e) potential or actual loss of well integrity

f) unauthorised releases of any volume of prescribed contaminants to waters

g) unauthorised releases of volumes of contaminants, in any mixture, to land greater than:

i. 200 L of hydrocarbons or

ii. 200 L of stimulation additives or

iii. 500 L of stimulation fluids or

iv. 1 000 L of brine or

v. 5 000 L of untreated coal seam gas water or

vi. 5 000 L of raw sewage or

vii. 10 000 L of treated sewage effluent.

h) the use of restricted stimulation fluids

i) groundwater monitoring results from a landholder's active groundwater bore monitored under the stimulation impact monitoring program which is a 10 percent or greater increase from a previous baseline value for that bore and which renders the water unfit for its intended use; and

j) monitoring results where two out of any five consecutive samples do not comply with the relevant limits in the environmental authority.

Contingency Plan for Emergency Events and Environmental Incidents

(A10) Authorised resource activities involving significant disturbance to land cannot commence until the development of written contingency procedures for emergency environmental incidents which include, but are not necessarily limited to:

a) a clear definition of what constitutes an environmental emergency incident or near miss for the authorised resource activities

b) consideration of the risks caused by the authorised resource activities including the impact of flooding and other natural events on the authorised resource activities

c) response procedures to be implemented to prevent or minimise the risks of environmental harm occurring

d) the practices and procedures to be employed to restore the environment or mitigate any environmental harm caused

e) procedures to investigate causes and impacts including impact monitoring programs for releases to waters and/or land

f) training of staff to enable them to effectively respond; and

g) procedures to notify the administering authority, local government and any potentially impacted landholder.

Maintenance of plant and equipment

(A11) All plant and equipment must be maintained and operated in their proper and effective condition.

(A12) The following infrastructure must be signed with a unique reference name or number in such a way that it is clearly observable:

a) regulated dams and low consequence dams
b) exploration, appraisal and development wells
c) water treatment facilities
d) brine encapsulation facilities
e) landfill cells
f) sewage treatment facilities
g) specifically authorised discharge points to air and waters
h) any chemical storage facility associated with the environmentally relevant activity of chemical storage
i) field compressor stations
j) central compressor stations
k) gas processing facilities; and
l) pipeline compressor stations.

(A13) Measures to prevent fauna being harmed from entrapment must be implemented during the construction and operation of well infrastructure, dams and pipeline trenches.

Underground Gas Storage

(A14) Testing, evaluating, developing and using natural underground reservoirs for petroleum storage or to store

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prescribed storage gases is not authorised under this environmental authority.

Erosion and sediment control

(A15) For activities involving significant disturbance to land, control measures that are commensurate to the site-specific risk of erosion, and risk of sediment release to waters must be implemented to:

a) allow stormwater to pass through the site in a controlled manner and at non-erosive flow velocities
b) minimise soil erosion resulting from wind, rain, and flowing water
c) minimise the duration that disturbed soils are exposed to the erosive forces of wind, rain, and flowing water
d) minimise work-related soil erosion and sediment runoff; and
e) minimise negative impacts to land or properties adjacent to the activities (including roads).

Complaints

(A16) Authorised resource activities must not cause environmental nuisance at a sensitive place, other than where an alternative arrangement is in place.

Documentation

(A17) A certification must be prepared by a suitably qualified person within 30 business days of completing every plan, procedure, program and report required to be developed under this environmental authority, which demonstrates that:

a) relevant material, including current published guidelines (where available) have been considered in the written document

b) the content of the written document is accurate and true; and

c) the document meets the requirements of the relevant conditions of the environmental authority.

(A18) All plans, procedures, programs, reports and methodologies required under this environmental authority must be written and implemented.

(A19) All documents required to be developed under this environmental authority must be kept for five years.

(A20) All documents required to be prepared, held or kept under this environmental authority must be provided to the administering authority upon written request within the requested timeframe.

(A21) A record of all complaints must be kept including the date, complainant's details, source, reason for the complaint, description of investigations and actions undertaken in resolving the complaint.

SCHEDULE B – WASTE MANAGEMENT

General

(B1) Measures must be implemented so that waste is managed in accordance with the waste and resource management hierarchy and the waste and resource management principles.

(B2) Waste, including waste fluids, but excluding waste used in closed-loop systems, must be transported off-site for lawful re-use, remediation, recycling or disposal, unless the waste is specifically authorised by conditions (B4) to (B14) to be disposed of or used on site.

(B3) Waste fluids, other than flare precipitant stored in flare pits, or residual drilling material or drilling fluids stored in sumps, must be contained in either:

a) an above ground container; or
b) a structure which contains the wetting front.

(B4) Green waste may be used on-site for either rehabilitation or sediment and erosion control, or both.

(B5) Vegetation waste may be burned if it relates to a state forest, timber reserve or forest entitlement area administered by the *Forestry Act 1959* and a permit has been obtained under the *Fire and Rescue Service Act 1990*.

Pipeline wastewater

(B6) Pipeline wastewater, may be released to land provided that it:

a) can be demonstrated it meets the acceptable standards for release to land; and

b) is released in a way that does not result in visible scouring or erosion or pooling or run-off or vegetation die-off.

Authorised uses of produced water for authorised resource activities

(B7) Produced water may be re-used in:

a) drilling and well hole activities; or

b) stimulation activities.

(B8) Produced water may be used for dust suppression provided the following criteria are met:

a) the amount applied does not exceed the amount required to effectively suppress dust; and

b) the application:

i. does not cause on-site ponding or runoff

ii. is not applied outside the area being suppressed

iii. does not harm vegetation surrounding the area being dust suppressed; and

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iv. does not cause visible salting.

(B9) Produced water may be used for construction purposes provided the use:

a) does not result in negative impacts on the composition and structure of soil or subsoils

b) is not directly or indirectly released to waters

c) does not result in runoff from the construction site; and

d) does not harm vegetation surrounding the construction site.

(B10) If there is any indication that any of the circumstances in condition (B8(b)(i)) to (B8(b)(iv)) or (B9(a)) to (B9(d)) is occurring the use must cease immediately and the affected area must be remediated without delay.

Sewage treatment

(B11) Treated sewage effluent or greywater can be released to land provided it:

a) meets or exceeds secondary treated class B standards for a treatment system with a daily peak design capacity of between 150 EP and 1500 EP or

b) meets or exceeds secondary treated class C standards for a treatment system with a daily peak design capacity of less than 150 EP.

(B12) The release of treated sewage effluent or greywater authorised in condition (B11) must:

a) be to a fenced and signed contaminant release area(s)

b) not result in pooling or run-off or aerosols or spray drift or vegetation die-off

c) be to a contaminant release area(s) that is kept vegetated with groundcover, that is:

i. not a declared pest species;

ii. kept in a viable state for transpiration and nutrient uptake; and

iii. grazed or harvested and removed from the contaminant release area as needed, but not less than every three months.

Residual drilling material

(B13) If sumps are used to store residual drilling material or drilling fluids, they must only be used for the duration of drilling activities.

(B14) Residual drilling material can only be disposed of on-site:

a) by mix-bury-cover method if the residual drilling material meets the approved quality criteria or

b) if it is certified by a suitably qualified third party as being of acceptable quality for disposal to land by the proposed method and that environmental harm will not result from the proposed disposal.

(B15) Records must be kept to demonstrate compliance with condition (B13) and (B14).

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SCHEDULE C – PROTECTING ACOUSTIC VALUES

General

(C1) Notwithstanding condition (A16), emission of noise from the authorised resource activities at levels less than those specified in *Schedule C, Protecting Acoustic Values, Table 1—Noise nuisance limits* are not considered to be environmental nuisance.

Schedule C, Protecting Acoustic Values, Table 1—Noise nuisance limits

Time period	Metric	Short term noise event	Medium term noise event	Long term noise event
7:00am—6:00pm	$L_{Aeq,adj,15\ mins}$	45 dBA	43 dBA	40 dBA
6:00pm—10:00pm	$L_{Aeq,adj,15\ mins}$	40 dBA	38 dBA	35 dBA
10:00pm—6:00am	$L_{Aeq,adj,15\ mins}$	28 dBA	28 dBA	28 dBA
	Max $L_{Aeq,adj,15\ mins}$	55 dBA	55 dBA	55 dBA
6:00am—7:00am	$L_{Aeq,adj,15\ mins}$	40 dBA	38 dBA	35 dBA

The noise limits in Table 1 have been set based on the following deemed background noise levels (LABG)*:*
7:00am—6:00 pm: 35 dBA
6:00pm—10:00 pm: 30 dBA
10:00pm—6:00 am: 25 dBA
6:00am—7:00 am: 30 dBA

(C2) If the noise subject to a valid complaint is tonal or impulsive, the adjustments detailed in *Schedule C, Protecting Acoustic Values, Table 2—Adjustments to be added to noise levels at sensitive receptors* are to be added to the measured noise level(s) to derive $L_{Aeq,\ adj,\ 15\ min}$.

Schedule C, Protecting Acoustic Values, Table 2—Adjustments to be added to noise levels at sensitive receptors

Noise characteristic	Adjustment to noise
Tonal characteristic is just audible	+ 2 dBA
Tonal characteristic is clearly audible	+ 5 dBA
Impulsive characteristic is detectable	+ 2 to + 5 dBA

(C3) Notwithstanding condition (C1), emission of any low frequency noise must not exceed either (C3(a)) and (C3(b)), or (C3(c)) and (C3(d)) in the event of a valid complaint about low frequency noise being made to the administering authority:

a) 60 dB(C) measured outside the sensitive receptor; and

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b) the difference between the external A-weighted and C-weighted noise levels is no greater than 20 dB; or

c) 50 dB(Z) measured inside the sensitive receptor; and

d) the difference between the internal A-weighted and Z-weighted (Max $L_{pZ,\ 15\ min}$) noise levels is no greater than 15 dB.

(C4) A Blast Management Plan must be developed for each blasting activity in accordance with Australian Standard 2187.

(C5) Blasting operations must be designed to not exceed an airblast overpressure level of 120 dB (linear peak) at any time, when measured at or extrapolated to any sensitive place.

(C6) Blasting operations must be designed to not exceed a ground-borne vibration peak particle velocity of 10mm/s at any time, when measured at or extrapolated to any sensitive place.

SCHEDULE D – PROTECTING AIR VALUES

Fuel burning or combustion equipment – authorised point sources

(D1) As of 22 January 2015, unless venting is authorised under the *Petroleum and Gas (Production and Safety) Act 2004* or the *Petroleum Act 1923*, waste gas from all new or refurbished flares must be flared in a manner that complies with all of (D1(a)) and (D1(b)) and (D1(c)), or with (D1(d)):

a) an automatic ignition system is used

b) a flame is visible at all times while the waste gas is being flared

c) there are no visible smoke emissions other than for a total period of no more than 5 minutes in any 2 hours; or

d) it uses an enclosed flare.

(D2) Contaminant releases to air emitted from fuel burning and combustion equipment point sources that are capable of burning at least 500 kg in an hour must be directed vertically upwards without any impedance or hindrance.

(D3) The holder of this environmental authority must maintain a register of fuel burning and combustion equipment that is capable of burning at least 500 kg of fuel in an hour that must include, as a minimum, the following information for each piece of equipment:

a) fuel burning or combustion equipment name and location

b) stack emission height (metres)

c) minimum efflux velocity (m/s)

d) mass emission rates (g/s); and

e) contaminant concentrations (mg/Nm^3 @ x $\%O_2$ dry gas at 0°Celsius and 1 atmosphere).

(D4) The holder of this environmental authority must ensure that the information contained in the register of fuel burning and combustion equipment is always current and complete.

(D5) All entries in the register of fuel burning and combustion equipment must be certified by the chief executive officer for the tenure holder, or their delegate, as being accurate and correct.

(D6) The operation of fuel burning or combustion facilities must not result in ground level concentrations of contaminants exceeding the maximum limit specified in *Schedule D, Protecting Air Values, Table 1—Maximum Ground Level Concentration Criteria*

Schedule D, Protecting Air Values, Table 1—Maximum Ground Level Concentration Criteria

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Contaminant	Concentration at 0°Celsius	Units	Averaging time
NOx as Nitrogen Dioxide	250	µg/m^3	1 hour
NOx as Nitrogen Dioxide	33	µg/m^3	1 year
Carbon Monoxide	11	mg/m^3	8 hours

(D7) An Air receiving environment monitoring program (AREMP) must be developed to demonstrate compliance with the limits in *Schedule D, Protecting Air Values, Table 1 – Maximum Ground Level Concentration Criteria.*

(D8) The AREMP must include, but not necessarily be limited to:

(a) the delineation of the relevant air shed(s)

(b) the identification of background reference sites and impact monitoring sites within the relevant air shed(s), including sensitive places

(c) a monitoring program to be carried out annually that:

(a) includes background reference and impact monitoring sites

(b) includes an assessment of meteorological conditions (wind speed and direction)

(c) is sufficient to determine compliance with the limits listed in *Schedule D, Protecting Air Values, Table 1 – Maximum Ground Level Concentration Criteria.*

(d) identifies the effects of the authorised contaminants released to air in the relevant air shed(s)

(e) is representative of when the fuel burning or combustion facilities are operating under maximum operating conditions for the annual period

(d) an assessment of the condition of each fuel burning or combustion facility; and

(e) and a description of other significant point sources in the air shed and surrounding land use including sensitive places.

(D9) An AREMP report must be written annually which includes the information required by condition (D8) and an assessment of the extent to which monitoring data for ground level concentrations complies with the air contaminant limits listed in *Schedule D, Protecting Air Values, Table 1 – Maximum Ground Level Concentration Criteria.*

(D10) Where monitoring data indicates that ground level concentrations listed in *Schedule D, Protecting Air Values, Table 1 – Maximum Ground Level Concentration Criteria* have not been met, the AREMP report required by condition (D9) must also include an assessment of:

(a) the extent to which the values of the air environment in the relevant air shed(s) are being protected

(b) an assessment of whether contaminant releases to the air environment are consistent with the air management hierarchy in the Environmental Protection (Air) Policy 2019, and

(c) any corrective actions that have been implemented or proposed to be implemented to become consistent with the air management hierarchy and achieve compliance with *Schedule D, Protecting Air Values, Table 1 – Maximum Ground Level Concentration Criteria.*

(D11) A statement of compliance prepared by a suitably qualified person must accompany each AREMP report required by condition (D9) and if applicable, condition (D10) stating:

(a) whether the AREMP as most recently implemented complies with the requirements of conditions (A4) condition (A8(d)), (D7) and (D8)

(b) that, to the best of the suitably qualified person's knowledge, the assessment required by condition (D9) and if applicable, condition (D10) is true, correct and complete, and

(c) that, to the best of the suitably qualified person's knowledge, all information provided as part of the statement of compliance, including attachments, is true, correct and complete.

(D12) Where condition (D10) applies, the documents required by conditions (D9), (D10) and (D11) must be given to the administering authority within 5 business days after the AREMP report is written.

SCHEDULE E – PROTECTING LAND VALUES

General

(E1) Contaminants must not be directly or indirectly released to land except for those releases authorised by conditions (B4) to (B14).

Top soil management

(E2) Top soil must be managed in a manner that preserves its biological and chemical properties.

Land management

(E3) Land that has been significantly disturbed by the authorised resource activities must be managed to ensure that mass movement, gully erosion, rill erosion, sheet erosion and tunnel erosion do not occur on that land.

Chemical storage

(E4) Chemicals and fuels stored, must be effectively contained and where relevant, meet Australian Standards, where such a standard is applicable.

Pipeline operation and maintenance

(E5) Pipeline operation and maintenance must be in accordance, to the greatest practicable extent, with the relevant section of the *APIA Code of Environmental Practice: Onshore Pipelines (2009)*.

Pipeline reinstatement and revegetation

(E6) Pipeline trenches must be backfilled and topsoils reinstated within three months after pipe laying.

(E7) Reinstatement and revegetation of the pipeline right of way must commence within 6 months after cessation of authorised resource activities for the purpose of pipeline construction.

(E8) Backfilled, reinstated and revegetated pipeline trenches and right of ways must be:

a) a stable landform
b) re-profiled to a level consistent with surrounding soils
c) re-profiled to original contours and established drainage lines; and
d) vegetated with groundcover which is not a declared pest species, and which is established and growing.

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SCHEDULE F – PROTECTING BIODIVERSITY VALUES

Confirming biodiversity values

(F1) Prior to undertaking activities that will result in significant disturbance to land in areas of native vegetation, confirmation of on-the-ground biodiversity values at that location must be undertaken by a suitably qualified person.

(F2) A suitably qualified person must develop and certify a methodology so that condition (F1) can be complied with and which is appropriate to confirm on-the-ground biodiversity values.

(F3) Except for condition (F10), where mapped biodiversity values differ from those confirmed under conditions (F1) and (F2), the authorised resource activities may proceed in accordance with the conditions of the environmental authority based on the confirmed on-the-ground biodiversity value.

Planning for land disturbance

(F4) The location of the authorised resource activities must be selected in accordance with the following site planning principles:

a) maximise the use of areas of pre-existing disturbance

b) in order of preference, avoid, minimise or mitigate any impacts, including cumulative impacts, on areas of native vegetation or other areas of ecological value

c) minimise disturbance to land that may result in land degradation

d) in order of preference, avoid then minimise isolation, fragmentation, edge effects or dissection of tracts of native vegetation; and

e) in order of preference, avoid then minimise clearing of native mature trees.

Planning for land disturbance – linear infrastructure

(F5) Linear infrastructure construction corridors must:

a) maximise co-location

b) be minimised in width to the greatest practicable extent; and

c) for linear infrastructure that is an essential petroleum activity authorised in an Environmentally Sensitive Area or its protection zone, be no greater than 40 metres or as stated in (F7).

Authorised disturbance to Environmentally Sensitive Areas

(F6) Where authorised resource activities are authorised to be carried out in Environmentally Sensitive Areas or their protection zones, the authorised resource activities must be carried out in accordance with *Schedule F,*

Protecting Biodiversity Values, Table 1—Authorised resource activities in Environmentally Sensitive Areas and their protection zones.

Schedule F, Protecting Biodiversity Values, Table 1—Authorised resource activities in Environmentally Sensitive Areas and their protection zones

Environmentally Sensitive Area	Within the Environmentally Sensitive Area	Primary protection zone of the Environmentally Sensitive Area	Secondary protection zone of the Environmentally Sensitive Area
Category A Environmentally Sensitive Areas	No authorised resource activities permitted.	Only low impact petroleum activities permitted.	Only essential petroleum activities permitted.
Category B Environmentally Sensitive Areas that are other than 'endangered' regional ecosystems	Only low impact petroleum activities permitted.	Only low impact petroleum activities permitted.	Only essential petroleum activities permitted.
Category B Environmentally Sensitive Areas that are 'endangered' regional ecosystems	Only low impact petroleum activities permitted.	Only essential petroleum activities permitted.	Only essential petroleum activities permitted.
Category C Environmentally Sensitive Areas that are 'nature refuges' or 'koala habitat'	Only low impact petroleum activities permitted.	Only low impact petroleum activities permitted.	
Category C Environmentally Sensitive Areas that are 'essential habitat', 'essential regrowth habitat', or 'of concern' regional ecosystems	Only low impact petroleum activities permitted.	Only essential petroleum activities permitted.	
Category C Environmentally Sensitive Areas that are 'regional parks' (previously known as 'resources reserves')	Only essential petroleum activities permitted.	Only essential petroleum activities permitted.	
Category C Environmentally Sensitive Areas that are 'state forests' or 'timber reserves'	Only essential petroleum activities permitted.	Authorised resource activities permitted.	
Areas of vegetation that are 'critically limited'	Only low impact petroleum activities permitted.	Only essential petroleum activities permitted.	

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(F7) Despite condition (F6) of this environmental authority, the infrastructure (and associated activities necessary for construction, operation and maintenance purposes) specified in *Schedule F, Protecting Biodiversity Values, Table 2—Authorised Resource Activity(ies) Disturbance* are permitted in the locations specified in *Schedule F, Protecting Biodiversity Values, Table 2—Authorised Resource Activity(ies) Disturbance***.**

Schedule F, Protecting Biodiversity Values, Table 2—Authorised Resource Activity(ies) Disturbance

Tenure	Description of Infrastructure	Number	Centre Point of Disturbance	Disturbance	Right of Way Width
PL94	Nipan Booster Compressor Station	1	Easting 197302 Northing 7261480 (MGA94 Map Zone 56J)	Secondary protection zone of Cat B ESA 0.36 hectares	N/A
	Nipan Tank Farm	1			
	Nipan Telemetry Tower	1			
	MEWL Trunk Line	1	24° 41’ 25.1” S 150° 00’ 06.7” E	Cat C ESA 0.5 hectares	20 metres
	Meridian Trunkline Phase 2 (MTL2)	1	24.7195396° S 150.0121350° E	Cat B ESA – 0.14 hectares, comprising: • Endangered RE 11.4.3 – 0.11 hectares • Endangered RE 11.3.1 – 0.03 hectares	13.5 metres
				Cat C ESA – Essential Habitat 0.11 hectares	
	Moura Central Processing Plant to Hillview Processing Plant (MCHV) gathering line	1	804118.9° E 7274695° S	Cat B ESA – 0.36 hectares, comprising: • Endangered RE 11.4.8 – 0.27 hectares • Endangered RE 11.4.9 – 0.09 hectares	13.5 metres
				Cat C ESA – Essential Habitat 0.27 hectares	
	Dawson River Water Treatment Plant to DR34 gathering lines	1	24.7946127° S 150.0128812° E	Cat B ESA, comprising: • Endangered RE 11.3.1 – 0.311 hectares	<10 metres

(F8) A report must be prepared for each annual return period for all authorised resource activities that involved clearing of any Environmentally Sensitive Area or protection zone which includes:

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a) records able to demonstrate compliance with conditions (F4), (F5) and (F6)

b) a description of the works

c) a description of the area and its pre-disturbance values (which may include maps or photographs, but must include GPS coordinates for the works); and

d) based on the extent of Environmentally Sensitive Areas and primary protection zones on the relevant resource authority(ies), the proportion of native vegetation cleared per Environmentally Sensitive Area and primary protection zone, including regional ecosystem type, over the annual return period.

Impacts to Matters of State Environmental Significance

(F9) Authorised resource activities are not permitted within areas containing matters of State environmental significance, unless the activity is authorised in condition (F10) of this environmental authority.

(F10) Despite condition (F9) of this environmental authority, low impact petroleum activities are authorised to occur within all types of matters of State environmental significance.

(F11) Significant residual impacts to prescribed environmental matters are not authorised under this environmental authority or the *Environmental Offsets Act 2014.*

SCHEDULE G – PROTECTING WATER VALUES

Authorised activities in watercourses, wetlands and springs

(G1) The extraction of groundwater as part of the petroleum activity(ies) from underground aquifers must not directly or indirectly cause environmental harm to a wetland

(G2) Petroleum activities must not occur in or within 200 m of a:

a) Wetland of high ecological significance

b) Great Artesian Basin Spring

c) Subterranean cave groundwater dependent ecosystem

(G3) Only construction or maintenance of linear infrastructure is permitted in or within any wetland of other environmental value or in a watercourse.

(G4) The construction or maintenance of linear infrastructure in a wetland or other environmental value must not result in the:

a) Clearing of riparian vegetation outside of the minimum area practicable to carry out the works; or

b) Ingress of saline water into freshwater aquifers; or

c) Draining or filling of the wetland beyond the minimum area practicable to carry out the works.

(G5) After the construction or maintenance works for linear infrastructure in a wetland of other environmental value are completed, the linear infrastructure must not:

a) drain or fill the wetland
b) prohibit the flow of surface water in or out of the wetland
c) lower or raise the water table and hydrostatic pressure outside the bounds of natural variability that existed before the activities commenced
d) result in ongoing negative impacts to water quality
e) result in bank instability; or
f) result in fauna ceasing to use adjacent areas for habitat, feeding, roosting or nesting.

(G6) The construction or maintenance of linear infrastructure activities in a watercourse must be conducted in the following preferential order:

a) firstly, in times where there is no water present

b) secondly, in times of no flow

c) thirdly, in times of flow, providing a bankfull situation is not expected and that flow is maintained.

(G7) The construction or maintenance of linear infrastructure authorised under condition (G3) must comply with the water quality limits as specified in *Schedule G, Protecting water values, Table 1 – Release limits for construction or maintenance of linear infrastructure.*

Schedule G, Protecting water values Table 1 – Release limits for construction or maintenance of linear infrastructure.

Water quality parameters	Units	Water quality limits
Turbidity	Nephelometric Turbidity Units (NTU)	For a wetland of other environmental value, if background water turbidity is above 45 NTU, no greater than 25% above background water turbidity measured within a 50 m radius of the construction or maintenance activity. For a watercourse, if background water turbidity is above 45 NTU, no greater than 25% above background water turbidity measured within 50m downstream of the construction or maintenance activity.
		For a wetland of other environmental value, if background water turbidity is equal to, or below 45 NTU, a turbidity limit of no greater than 55 NTU applies, measured within a 50 m radius of the construction or maintenance activity. For a watercourse, if background water turbidity is equal to, or below 45 NTU, a turbidity limit of no greater than 55 NTU applies, measured within 50 m downstream of the construction or maintenance activity.
Hydrocarbons	-	For a wetland of other environmental value, or watercourse, no visible sheen or slick

(G8) Routine, regular and frequent visual monitoring must be undertaken while carrying out linear infrastructure work and any maintenance of completed works in a watercourse, wetland, lake or spring.

(G9) If, due to linear infrastructure works, water turbidity increases in a watercourse, wetland, lake or spring outside contained areas, works must cease and the sediment control measures must be rectified to limit turbidity before the works recommence.

Authorised activities in floodplains

(G10) Authorised resource activity(ies) on floodplains must be carried out in a way that does not:

a) concentrate flood flows in a way that will or may cause or threaten a negative environmental impact; or

b) divert flood flows from natural drainage paths and alter flow distribution; or

c) increase the local duration of floods; or

d) increase the risk of detaining flood flows.

Authorised impacts to groundwater

(G11) The extraction of groundwater as part of the authorised resource activity(ies) from underground aquifers must not directly or indirectly cause environmental harm to a wetland.

Groundwater Impact Monitoring Program

(G12) A Groundwater Monitoring Program must be developed and implemented which is able to detect any changes to groundwater quality as a result of storing contaminants in a containment facility(ies) (e.g. surface dams, monocells).

(G13) The Groundwater Monitoring Program must be developed and implemented by a suitably qualified person in the fields of hydrogeology, groundwater sampling design and groundwater monitoring program design.

(G14) The Groundwater Monitoring Program, must include, but not necessarily be limited to:

a) locations of monitoring sites, monitoring methodology and trigger values for detecting impacts on groundwater quality

b) as a minimum, sampling of the parameters and at the frequency listed in *Schedule G, Protecting Water Values, Table 2 – Groundwater Monitoring Parameters and Monitoring Frequency*

c) procedures to establish background groundwater quality

d) sampling of groundwater in accordance with the requirements for baseline bore, well and stimulation impact monitoring as per conditions (I14) to (I16); and

e) a sufficient number of monitoring sites to provide information on the following:

i. seepage to groundwater and surrounding soils from any regulated dam and its effect on groundwater and soils and

ii. background monitoring sites (i.e. groundwater quality in representative bores that have not been affected by the authorised resource activity(ies) authorised under this environmental authority)

iii. the conduct of a geodetic survey of all monitoring bores to determine the relative water surface elevations of each bore and reported in metres relative to the AHD and

iv. the determination of groundwater flow direction, groundwater flow rate and hydraulic conductivity; and

v. a rationale containing details on the program purpose, program conceptualisation and verification of assumptions.

(G15) All groundwater monitoring bores must be installed according to the standards outlined in the National Water Commission's *Minimum Construction Requirements for Water Bores in Australia 2012*, the Department of Natural Resources and Mines' *Minimum standards for the construction and reconditioning of water bores that intersect the sediments of artesian basins in Queensland 2014* or *Code of Practice for constructing and abandoning coal seam gas wells and associated bored in Queensland 2013* as amended from time to time.

(G16) Groundwater monitoring bores must be constructed by, or under the supervision of a licensed Queensland water bore driller who has the correct endorsements on their licence for the type of activity being performed.

(G17) Groundwater samples must be monitored for the water quality parameters at the minimum frequencies specified in *Schedule G, Protecting Water Values, Table 2 – Groundwater Monitoring Parameters and Monitoring Frequency.*

Schedule G, Protecting Water Values, Table 2 – Groundwater Monitoring Parameters and Monitoring Frequency

Groundwater Parameter	Monitoring frequency
Water level [m]	Quarterly
Groundwater pressure in geological strata [kPa]	Biannually
pH	Biannually
Electrical conductivity [µS/m]	Biannually
Total dissolved solids [mg/L]	Biannually
Temperature [ºC]	Biannually
Dissolved oxygen [mg/L]	Biannually
Alkalinity (bicarbonate, carbonate, hydroxide and total as $CaCO_3$) [mg/L]	Biannually
Sodium adsorption ratio (SAR)	Biannually
Anions (bicarbonate, carbonate, hydroxide, chloride, sulphate) [mg/L]	Biannually
Cations (aluminium, calcium, magnesium, potassium, sodium) [mg/L]	Biannually
Silica [mg/L]	Biannually
Dissolved and total metals (including but not necessarily being limited to: aluminium, arsenic, barium, borate (boron), cadmium, chromium III, copper, iron, fluoride, lead, manganese, mercury, nickel, selenium, silver, strontium, tin and zinc) [µg/L]	Biannually
Total phosphorus as phosphorus [mg/L]	
Ammonia, nitrate and nitrite as nitrogen [mg/L]	Biannually
Total petroleum hydrocarbons [mg/L]	Biannually
BTEX (as benzene, toluene, ethylbenzene, ortho-xylene, para-xylene, meta-xylene and total xylene) [µg/L]	Biannually
Polycyclic aromatic hydrocarbons (including but not necessarily limited to: naphthalene, phenanthrene, benzo[a]pyrene) [ug/L]	Biannually
Gross alpha + gross beta or radionuclides by gamma spectroscopy [Bq/L]	Biannually

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SCHEDULE H – REHABILITATION

Rehabilitation planning

(H1) A Rehabilitation Plan must be developed by a suitably qualified person and must include the:

a) rehabilitation goals; and

b) procedures to be undertaken for rehabilitation that will:

i. achieve the requirements of conditions (H2) to (H6), inclusive; and

ii. provide for appropriate monitoring and maintenance.

Transitional rehabilitation

(H2) Significantly disturbed areas that are no longer required for the on-going authorised resource activities, must be rehabilitated within 12 months (unless an exceptional circumstance in the area to be rehabilitated (e.g. a flood event) prevents this timeframe being met) and be maintained to meet the following acceptance criteria:

a) contaminated land resulting from authorised resource activities is remediated and rehabilitated

b) the areas are:

i. non-polluting

ii. a stable landform

iii. re-profiled to contours consistent with the surrounding landform

c) surface drainage lines are re-established

d) top soil is reinstated; and

e) either:

i. groundcover, that is not a declared pest species, is growing; or

ii. an alternative soil stabilisation methodology that achieves effective stabilisation is implemented and maintained.

Final rehabilitation acceptance criteria

(H3) All significantly disturbed areas caused by authorised resource activities which are not being or intended to be utilised by the landholder or overlapping tenure holder, must be rehabilitated to meet the following final acceptance criteria measured either against the highest ecological value adjacent land use or the pre-disturbed land use:

a) greater than or equal to 70 percent of native ground cover species richness

b) greater than or equal to the total per cent of ground cover

c) less than or equal to the per cent species richness of declared plant pest species; and

d) where the adjacent land use contains, or the pre-clearing land use contained, one or more regional ecosystem(s), then at least one regional ecosystem(s) from the same broad vegetation group, and with the equivalent biodiversity status or a biodiversity status with a higher conservation value as any of the regional ecosystem(s) in either the adjacent land or pre-disturbed land, must be present.

Final rehabilitation acceptance criteria in Environmentally Sensitive Areas

(H4) Where significant disturbance to land has occurred in an Environmentally Sensitive Area, the following final rehabilitation criteria as measured against the pre-disturbance biodiversity values assessment (required by conditions (F1) and (F2) must be met:

a) greater than or equal to 70 percent of native ground cover species richness

b) greater than or equal to the total per cent ground cover

c) less than or equal to the per cent species richness of declared plant pest species

d) greater than or equal to 50 percent of organic litter cover

e) greater than or equal to 50 percent of total density of coarse woody material; and

f) all predominant species in the ecologically dominant layer, that define the pre-disturbance regional ecosystem(s) are present.

Continuing conditions

(H5) Conditions (H2), (H3) and (H4) continue to apply after this environmental authority has ended or ceased to have effect.

Remaining dams

(H6) Where there is a dam (including a low consequence dam) that is being or intended to be utilised by the landholder or overlapping tenure holder, the dam must be decommissioned to no longer accept inflow from the authorised resource activity(ies) and the contained water must be of a quality suitable for the intended on-going uses(s) by the landholder or overlapping tenure holder.

SCHEDULE I – WELL CONSTRUCTION, MAINTENANCE AND STIMULATION ACTIVITIES

Drilling activities

(I1) Oil based or synthetic based drilling muds must not be used in the carrying out of the authorised resource activity(ies).

(I2) Drilling activities must not result in the connection of the target gas producing formation and another aquifer.

(I3) Practices and procedures must be in place to detect, as soon as practicable, any fractures that have or may result in the connection of a target formation and another aquifer as a result of drilling activities.

Stimulation activities

(I4) Polycyclic aromatic hydrocarbons or products that contain polycyclic aromatic hydrocarbons must not be used in stimulation fluids in concentrations above the reporting limit.

(I5) Stimulation activities must not negatively affect water quality, other than that within the stimulation impact zone of the target gas producing formation.

(I6) Stimulation activities must not cause the connection of the target gas producing formation and another aquifer.

(I7) The internal and external mechanical integrity of the well system prior to and during stimulation must be ensured such that there is:

a) no significant leakage in the casing, tubing, or packer; and

b) there is no significant fluid movement into another aquifer through vertical channels adjacent to the well bore hole.

(I8) Practices and procedures must be in place to detect, as soon as practicable, any fractures that cause the connection of a target gas producing formation and another aquifer.

Stimulation Risk Assessment

(I9) Prior to undertaking stimulation activities, a risk assessment must be developed and implemented to ensure that stimulation activities are managed to prevent environmental harm.

(I10) The stimulation risk assessment must be carried out for every well to be stimulated prior to stimulation being carried out at that well and address issues at a relevant geospatial scale such that changes to features and attributes are adequately described and must include, but not necessarily be limited to:

a) a process description of the stimulation activity to be applied, including equipment and a comparison to best international practice

b) provide details of where, when and how often stimulation is to be undertaken on the tenures covered by this environmental authority

c) a geological model of the field to be stimulated including geological names, descriptions and depths of the target gas producing formation(s)

d) naturally occurring geological faults

e) seismic history of the region (e.g. earth tremors, earthquakes)

f) proximity of overlying and underlying aquifers

g) description of the depths that aquifers with environmental values occur, both above and below the target gas producing formation

h) identification and proximity of landholder's active groundwater bores in the area where stimulation activities are to be carried out

i) the environmental values of groundwater in the area

j) an assessment of the appropriate limits of reporting for all water quality indicators relevant to stimulation monitoring in order to accurately assess the risks to environmental values of groundwater

k) description of overlying and underlying formations in respect of porosity, permeability, hydraulic conductivity, faulting and fracture propensity

l) consideration of barriers or known direct connections between the target gas producing formation and the overlying and underlying aquifers

m) a description of the well mechanical integrity testing program

n) process control and assessment techniques to be applied for determining extent of stimulation activities (e.g. microseismic measurements, modelling etc.)

o) practices and procedures to ensure that the stimulation activities are designed to be contained within the target gas producing formation

p) groundwater transmissivity, flow rate, hydraulic conductivity and direction(s) of flow

q) a description of the chemical compounds used in stimulation activities (including estimated total mass, estimated composition, chemical abstract service numbers and properties), their mixtures and the resultant compounds that are formed after stimulation

r) a mass balance estimating the concentrations and absolute masses of chemical compounds that will be reacted, returned to the surface or left in the target gas producing formation subsequent to stimulation

s) an environmental hazard assessment of the chemicals used including their mixtures and the resultant chemicals that are formed after stimulation including:

    i. toxicological and ecotoxicological information of chemical compounds used

    ii. information on the persistence and bioaccumulation potential of the chemical compounds used; and

iii. identification of the chemicals of potential concern in stimulation fluids derived from the risk assessment.

t) an environmental hazard assessment of use, formation of, and detection of polycyclic aromatic hydrocarbons in stimulation activities

u) identification and an environmental hazard assessment of using radioactive tracer beads in stimulation activities

v) an environmental hazard assessment of leaving chemical compounds in stimulation fluids in the target gas producing formation for extended periods subsequent to stimulation

w) human health exposure pathways to operators and the regional population

x) risk characterisation of environmental impacts based on the environmental hazard assessment

y) potential impacts to landholder bores as a result of stimulation activities

z) an assessment of cumulative underground impacts, spatially and temporally of the stimulation activities to be carried out on the tenures covered by this environmental authority; and

aa) potential environmental or health impacts which may result from stimulation activities including but not limited to water quality, air quality (including suppression of dust and other airborne contaminants), noise and vibration.

(I11) A summary of each stimulation risk assessment must be submitted to the administering authority upon request.

Water quality baseline monitoring

(I12) Prior to undertaking any stimulation activity, a baseline bore assessment must be undertaken of the water quality of:

a) all landholder's active groundwater bores (subject to access being permitted by the landholder) that are spatially located within a two (2) kilometre horizontal radius from the location of the stimulation initiation point within the target gas producing formation and

b) all landholders' active groundwater bores (subject to access being permitted by the landholder) in any aquifer that is within 200 metre above or below the target gas producing formation and is spatially located with a two (2) kilometre radius from the location of the stimulation initiation point; and

c) any other bore that could potentially be adversely impacted by the stimulation activities in accordance with the findings of the risk assessment required by conditions (I9) and (I10).

(I13) Prior to undertaking stimulation activities at a well, there must be sufficient water quality data to accurately represent the water quality in the well to be stimulated. The data must include as a minimum the results of analyses for the parameters in condition (I14).

(I14) Baseline bore and well assessments must include relevant analytes and physico-chemical parameters to be monitored in order to establish baseline water quality and must include, but not necessarily be limited to:

a) pH

b) electrical conductivity [µS/m]

c) turbidity [NTU]

d) total dissolved solids [mg/L]

e) temperature [ºC]

f) dissolved oxygen [mg/L]

g) dissolved gases (methane, chlorine, carbon dioxide, hydrogen sulfide) [mg/L]

h) alkalinity (bicarbonate, carbonate, hydroxide and total as CaCO3) [mg/L]

i) sodium adsorption ratio (SAR)

j) anions (bicarbonate, carbonate, hydroxide, chloride, sulphate) [mg/L]

k) cations (aluminium, calcium, magnesium, potassium, sodium) [mg/L]

l) dissolved and total metals and metalloids (including but not necessarily being limited to: aluminium, arsenic, barium, borate (boron), cadmium, total chromium, copper, iron, fluoride, lead, manganese, mercury, nickel, selenium, silver, strontium, tin and zinc) [µg/L]

m) total petroleum hydrocarbons [µg/L]

n) BTEX (as benzene, toluene, ethylbenzene, ortho-xylene, para- and meta-xylene, and total xylene) [µg/L]

o) polycyclic aromatic hydrocarbons (including but not necessarily being limited to: naphthalene, phenanthrene, benzo[a]pyrene) [µg/L]

p) sodium hypochlorite [mg/L]

q) sodium hydroxide [mg/L]

r) formaldehyde [mg/L]

s) ethanol [mg/L] and

t) gross alpha + gross beta or radionuclides by gamma spectroscopy [Bq/L].

Stimulation Impact Monitoring Program

(I15) A Stimulation Impact Monitoring Program must be developed prior to the carrying out of stimulation activities which must be able to detect adverse impacts to water quality from stimulation activities and must consider the

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findings of the risk assessment required by conditions (I9) and (I10) that relate to stimulation activities and must include, as a minimum, monitoring of:

a) the stimulation fluids to be used in stimulation activities at sufficient frequency and which sufficiently represents the quantity and quality of the fluids used
b) flow back waters from stimulation activities at sufficient frequency and which sufficiently represents the quality of that flow back water
c) flow back waters from stimulation activities at sufficient frequency and accuracy to demonstrate that 150 percent of the volume used in stimulation activities has been extracted from the stimulated well and
d) all bores in accordance with condition (I12).

(I16) The Stimulation Impact Monitoring Program must provide for monitoring of:

a) analytes and physico-chemical parameters relevant to baseline bore and well assessments to enable data referencing and comparison including, but not necessarily being limited to the analytes and physico-chemical parameters in condition (I14) and
b) any other analyte or physico-chemical parameters that will enable detection of adverse water quality impacts and the inter-connection with a non-target aquifer as a result of stimulation activities including chemical compounds that are actually or potentially formed by chemical reactions with each other or coal seam materials during stimulation activities.

(I17) The Stimulation Impact Monitoring Program must provide for monitoring of the bores in condition (I15(d)) at the following minimum frequency:

a) monthly for the first six (6) months subsequent to stimulation activities being undertaken then
b) annually for the first five (5) years subsequent to stimulation being undertaken or until analytes and physico-chemical parameters listed in conditions (I14(a)) to (I14(t)) inclusive, are not detected in concentrations above baseline bore monitoring data on two (2) consecutive monitoring occasions.

(I18) The results of the Stimulation Impact Monitoring Program must be made available to any potentially affected landholder upon request by that landholder.

SCHEDULE J – STRUCTURES

Assessment of consequence category

(J1) The consequence category of any structure must be assessed by a suitably qualified and experienced person in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* at the following times:

a) prior to the design and construction of the structure, if it is not an existing structure or

b) if it is an existing structure, prior to the adoption of this schedule or

c) prior to any change in its purpose or the nature of its stored contents.

(J2) A consequence assessment report and certification must be prepared for each structure assessed and the report may include a consequence assessment for more than one structure.

(J3) Certification must be provided by the suitably qualified and experienced person who undertook the assessment, in the form set out in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.

Low consequence dams

(J4) Where a dam is assessed as low consequence, it must be:

a) constructed, operated and maintained in accordance with accepted engineering standards currently appropriate for the purpose for which the dam is intended to be used; and

b) designed with a floor and sides made of material that will contain the wetting front and any entrained contaminants within the bounds of the containment system during both its operational life and including any period of decommissioning and rehabilitation.

(J5) Where the consequence category of a low consequence dam is for the first time assessed as significant or high, the holder of this environmental authority must ensure that the dam meets the hydraulic performance required of the assessed consequence category within 12 months of that assessment.

(J6) In the event of early signs of loss of structural or hydrological integrity of a low consequence dam, the holder of this environmental authority must:

a) take immediate action to prevent or minimise any actual or potential environmental harm and

b) within 20 business days of that event, report in writing to the administering authority any findings and actions taken.

Monitoring of low consequence dams

(J7) The condition of all low consequence dams must be monitored for early signs of loss of structural or hydraulic integrity, based on the advice of a suitably qualified and experienced person. The methods of monitoring and frequency of monitoring shall be as assessed by the person who conducts the consequence assessment based on the particular circumstances of each dam.

Design and construction of a regulated structure

(J8) Conditions (J9) to (J10) inclusive do not apply to existing structures

(J9) All regulated structures must be designed by, and constructed under the supervision of, a suitably qualified and experienced person in accordance with the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.

(J10) Construction of a regulated structure is prohibited unless the holder has submitted a consequence category assessment report and certification to the administering authority that has been certified by a suitably qualified and experienced person for the design and design plan, and the associated operating procedures are compliant with the relevant condition of this environmental authority.

(J11) Certification must be provided by the suitably qualified and experienced person who oversees the preparation of the design plan in the form set out in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635),* and must be recorded in the Register of Regulated Structures.

(J12) Regulated structures must:

a) be designed and constructed in accordance with and conform to the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*

b) be designed and constructed with due consideration given to ensuring that the design integrity would not be compromised on account of:

i. floodwaters from entering the regulated dam from any watercourse or drainage line and

ii. wall failure due to erosion by floodwaters arising from any watercourse or drainage line.

c) have the floor and sides of the dam designed and constructed to prevent or minimise the passage of the wetting front and any entrained contaminants through either the floor or sides of the dam during the operational life of the dam and for any period of decommissioning and rehabilitation of the dam.

(J13) Certification by the suitably qualified and experienced person who supervises the construction must be submitted to the administering authority on the completion of construction of the regulated structure, and state that:

a) the 'as constructed' drawings and specifications meet the original intent of the design plan for that regulated structure

b) construction of the regulated structure is in accordance with the design plan.

Aggregation dams

(J14) All aggregation dams must:

a) be designed with a floor and sides of material that will contain the wetting front and any entrained contaminants within the bounds of the containment system during its operational life including any period of decommissioning and rehabilitation; and

b) have a system that will detect any passage of the wetting front or entrained contaminants through the floor or sides of the dam.

Brine dams

(J15) All brine dams must:

a) be designed with a floor and sides of material that will contain the wetting front and any entrained contaminants within the bounds of the containment system during its operational life including any period of decommissioning and rehabilitation and

b) have a system that will detect any passage of the wetting front or entrained contaminants through the floor or sides of the dam; and

c) have a system for the collection and proper disposal of any contaminants that move beyond the bounds of the containment system.

Operation of a regulated structure

(J16) Operation of a regulated structure**,** except for an existing structure, is prohibited unless the holder has submitted to the administering authority;

i. one paper copy and one electronic copy of the design plan and certification of the 'design plan' in accordance with condition (J10), and

ii. a set of 'as constructed' drawings and specifications, and

iii. certification of those 'as constructed drawings and specifications' in accordance with condition (J13), and

iv. where the regulated structure is to be managed as part of an integrated containment system for the purpose of sharing the DSA volume across the system, a copy of the certified system design plan

v. the requirements of this environmental authority relating to the construction of the regulated structure have been met

vi. the holder has entered the details required under this environmental authority, into a Register of Regulated Structures and

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vii. there is a current operational plan for the regulated structures.

(J17) For existing structures that are regulated structures:

a) where the existing structure that is a regulated structure is to be managed as part of an integrated containment system for the purpose of sharing the DSA volume across the system, the holder must submit to the administering authority within 12 months of the commencement of this condition a copy of the certified system design plan including that structure and

b) there must be a current operational plan for the existing structures.

(J18) Each regulated structure must be maintained and operated, for the duration of its operational life until decommissioned and rehabilitated, in a manner that is consistent with the current operational plan and, if applicable, the current design plan and associated certified 'as constructed' drawings.

Mandatory Reporting Level

(J19) Conditions (J20) to (J23) inclusive only apply to regulated structures which have not been certified as low consequence category for 'failure to contain – overtopping'.

(J20) The Mandatory Reporting Level (the MRL) must be marked on a regulated dam in such a way that during routine inspections of that dam, it is clearly observable.

(J21) The holder must, as soon as practical and within forty-eight (48) hours of becoming aware, notify the administering authority when the level of the contents of a regulated dam reaches the MRL.

(J22) The holder must, immediately on becoming aware that the MRL has been reached, act to prevent the occurrence of any unauthorised discharge from the regulated dam.

(J23) The holder must record any changes to the MRL in the Register of Regulated Structures.

Design storage allowance (DSA)

(J24) The holder must assess the performance of each regulated dam or linked containment system over the preceding November to May period based on actual observations of the available storage in each regulated dam or linked containment system taken prior to 1 July of each year.

(J25) By 1 November of each year, storage capacity must be available in each regulated dam (or network of linked containment systems with a shared DSA volume), to meet the DSA volume for the dam (or network of linked containment systems).

(J26) The holder must, as soon as possible and within forty-eight (48) hours of becoming aware that the regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on 1 November of any year, notify the administering authority.

(J27) The holder must, immediately on becoming aware that a regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on 1 November of any year, act to prevent the occurrence of any unauthorised discharge from the regulated dam or linked containment systems.

Annual inspection report

(J28) Each regulated structure must be inspected each calendar year by a suitably qualified and experienced person.

(J29) At each annual inspection, the condition and adequacy of all components of the regulated structure must be assessed and a suitably qualified and experienced person must prepare an annual inspection report containing details of the assessment and include recommended actions to ensure the integrity of the regulated structure.

(J30) The suitably qualified and experienced person who prepared the annual inspection report must certify the report in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.

(J31) The holder must:

a) Within 20 business days of receipt of the annual inspection report, provide to the administering authority:

   i. the recommendations section of the annual inspection report and

   ii. if applicable, any actions being taken in response to those recommendations and

b) If, following receipt of the recommendations and (if applicable) actions, the administering authority requests a full copy of the annual inspection report from the holder, provide this to the administering authority within 10 business days of receipt of the request.

Transfer arrangements

(J32) The holder must provide a copy of any reports, documentation and certifications prepared under this environmental authority, including but not limited to any Register of Regulated Structures, consequence assessment, design plan and other supporting documentation, to a new holder on transfer of this authority.

Register of Regulated Structures

(J33) A Register of Regulated Structures must be established and maintained by the holder for each regulated dam:

(J34) The holder must provisionally enter the required information in the Register of Regulated Structures when a design plan for a regulated dam is submitted to the administering authority.

(J35) The holder must make a final entry of the required information in the Register of Regulated Structures once compliance with conditions (J16) and (J17) has been achieved.

(J36) The holder must ensure that the information contained in the Register of Regulated Structures is current and complete on any given day.

(J37) All entries in the Register of Regulated Structures must be approved by the chief executive officer for the holder of this environmental authority, or their delegate, as being accurate and correct.

(J38) The holder must, at the same time as providing the annual return, supply to the administering authority a copy of the records contained in the Register of Regulated Structures, in the electronic format required by the administering authority.

Transitional arrangements

(J39) All existing aggregation dams must meet the requirements of condition (J14) by 1 October 2011.

(J40) All existing brine dams must meet the requirements of condition (J15) by 1 October 2011.

(J41) All existing coal seam gas evaporation dams must meet the requirements of conditions (J14) or (J15), relevant to its intended use, by 1 October 2011.

Regulated dam water quality monitoring

(J42) The holder of this environmental authority must monitor the quality of water in all regulated dams on the relevant resource authority(ies) in the month of October every year.

(J43) The monitoring of regulated dam water must include sufficient analytes and physico-chemical parameters to characterise water quality in the dam and must include, but not necessarily be limited to:

a) pH

b) electrical conductivity [µS/m]

c) turbidity [NTU]

d) total dissolved solids [mg/L]

e) temperature [ºC]

f) dissolved oxygen [mg/L]

g) alkalinity (bicarbonate, carbonate, hydroxide and total as $CaCO_3$) [mg/L]

h) sodium adsorption ratio (SAR)

i) anions (bicarbonate, carbonate, hydroxide, chloride, sulphate) [mg/L]

j) cations (aluminium, calcium, magnesium, potassium, sodium) [mg/L]

k) silica [mg/L]

l) dissolved and total metals (including but not necessarily limited to: aluminium, arsenic, barium, borate (boron), cadmium, chromium III, copper, iron, fluoride, lead, manganese, mercury, nickel, selenium, silver, strontium, tin and zinc) [µg/L]

m) total phosphorus [mg/L]

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n) ammonia, nitrate, nitrite as nitrogen [mg/L]

o) total petroleum hydrocarbons [µg/L]

p) BTEX (as benzene, toluene, ethylbenzene, ortho-xylene, para-xylene, meta-xylene and total xylene) [µg/L]

q) polycyclic aromatic hydrocarbons (including but not necessarily being limited to naphthalene, phenanthrene, benzo[a]pyrene) [µg/L]

r) chlorophyll a [µg/L] and

s) total cyanobacteria biovolume [cells/mg/L] and

t) gross alpha + gross beta or radionuclides by gamma spectroscopy [Bq/L].

(J44) Water quality samples of regulated dams must be taken from at least three (3) different dam profile depths for each sampling event and be taken as far as practicable from the edge of the regulated dam.

Brine Storage Tanks

(J45) Brine storage tanks associated with the reverse osmosis water treatment facility authorised by this activity must be designed and constructed to any relevant Australian Standard that deals with strength and structural integrity of that tank.

(J46) A record of certification, that confirms that the construction of the brine storage tank meets the relevant Australian Standard must be obtained prior to the commissioning of the tank. The record of certification must be kept until the tank is decommissioned and the tank removed from the environmental authority.

(J47) An inspection of the integrity of the brine storage tanks must be undertaken at least once every five years.

(J48) All brine tanks must:

a) be designed to be impervious to any entrained contaminants for the duration of the tanks operational life including any period of decommissioning and rehabilitation; and

b) have a primary and secondary containment system that allows for detection and collection of any contaminants in case of a failure of the primary containment system. This may be satisfied by the use of a dual liner within the tank.

SCHEDULE K – DEFINITIONS

acceptable standards for release to land	means wastewater of the following quality as determined by monitoring results or by characterisation: (a) electrical conductivity (EC) not exceeding 3000 µS/cm (b) sodium adsorption ratio (SAR) not exceeding 8 (c) pH between 6.0 and 9.0 (d) heavy metals (measured as total) meets the respective short term trigger value in section 4.2.6, Table 4.2.10—Heavy metals and metalloids in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (e) does not contain biocides.
accepted engineering standards	in relation to dams, means those standards of design, construction, operation and maintenance that are broadly accepted within the profession of engineering as being good practice for the purpose and application being considered. In the case of dams, the most relevant documents would be publications of the Australian National Committee on Large Dams (ANCOLD), guidelines published by Queensland government departments and relevant Australian and New Zealand Standards.
adjacent land use(s)	means the ecosystem function adjacent to an area of significant disturbance, or where there is no ecosystem function, the use of the land. An adjacent land use does not include an adjacent area that shows evidence of edge effect.
administering authority	means: (a) for a matter, the administration and enforcement of which has been devolved to a local government under section 514 of the *Environmental Protection Act 1994*—the local government; or (b) for all other matters—the Chief Executive of the Department of Environment and Heritage Protection; or (c) another State Government Department, Authority, Storage Operator, Board or Trust, whose role is to administer provisions under other enacted legislation.
aggregation dam	means a regulated dam that receives and contains coal seam gas water or coal seam gas concentrate. The primary purpose of the dam must not be to evaporate the water even though this will naturally occur.

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alternative arrangement	means a written agreement about the way in which a particular environmental nuisance impact will be dealt with at a sensitive place, and may include an agreed period of time for which the arrangement is in place. An alternative arrangement may include, but is not limited to, a range of nuisance abatement measures to be installed at the sensitive place, or provision of alternative accommodation for the duration of the relevant nuisance impact.
analogue site(s)	means an area of land which contains values and characteristics representative of an area to be rehabilitated prior to disturbance. Such values must encompass land use, topographic, soil, vegetation, vegetation community attributes and other ecological characteristics. Analogue sites can be the pre-disturbed site of interest where significant surveying effort has been undertaken to establish benchmark parameters.
analyte	means a chemical parameter determined by either physical measurement in the field or by laboratory analysis.
annual inspection report	means an assessment prepared by a suitably qualified and experienced person containing details of the assessment against the most recent consequence assessment report and design plan (or system design plan) a) against recommendations contained in previous annual inspections reports b) against recognised dam safety deficiency indicators c) for changes in circumstances potentially leading to a change in consequence category d) for conformance with the conditions of this authority e) for conformance with the 'as constructed' drawings f) for the adequacy of the available storage in each regulated dam, based on an actual observation or observations taken after 31 May each year but prior to 1 November of that year, of accumulated sediment, state of the containment barrier and the level of liquids in the dam (or network of linked containment systems) g) for evidence of conformance with the current operational plan.
annual return period	means the 12 month period from 1 January to 31 December in a calendar year.
appraisal well	means a petroleum well to test the potential of one (1) or more natural underground reservoirs for producing or storing petroleum. For clarity, an appraisal well does not include an exploration well.
approved quality criteria	for the purposes of residual drilling materials, means the residual drilling material meet the following quality standards:

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Part A In all cases:

Parameter	Maximum concentration
pH	6–10.5 (range)
Electrical Conductivity	20 dS/m (20,000 µS/cm)
Chloride*	8000 mg/L

*Chloride analysis is only required if an additive containing chloride was used in the drilling process.

The limits in Part A must be measured in the clarified filtrate of oversaturated solids prior to mixing.

Part B If any of the following metals are a component of the drilling fluids, then for that metal:

Parameter	Maximum concentration
Arsenic	20 mg/kg
Selenium	5 mg/kg
Boron	100 mg/kg
Cadmium	3 mg/kg
Chromium (total)	400 mg/kg
Copper	100 mg/kg
Lead	600 mg/kg

The limits in Part B and Part C refer to the post soil/by-product mix.

Part C If a hydrocarbon sheen is visible, the following hydrocarbon fractions:

TPH	Maximum concentration
C6-C10	170 mg/kg
C10-C16	150 mg/kg
C16-C34	1300 mg/kg
C34-C40	5600 mg/kg
Total Polycyclic Aromatic Hydrocarbons (PAHs)	20 mg/kg
Phenols (halogenated)	1 mg/kg
Phenols (non-halogenated)	60 mg/kg

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	<table><tr><td>Monocyclic aromatic hydrocarbons *(Total sum of benzene, toluene, ethyl benzene, xylenes (includes ortho, para and meta xylenes) and styrene)*</td><td>7 mg/kg</td></tr><tr><td>Benzene</td><td>1 mg/kg</td></tr></table>
areas of pre-existing disturbance	means areas where environmental values have been negatively impacted as a result of anthropogenic activity and these impacts are still evident. Areas of pre-disturbance may include areas where legal clearing, logging, timber harvesting, or grazing activities have previously occurred, where high densities of weed or pest species are present which have inhibited re-colonisation of native regrowth, or where there is existing infrastructure (regardless of whether the infrastructure is associated with the authorised resource activities). The term 'areas of pre-disturbance' does not include areas that have been impacted by wildfire/s, controlled burning, flood or natural vegetation die-back.
associated water	means underground water taken or interfered with, if the taking or interference happens during the course of, or results from, the carrying out of another authorised activity under a resource authority, such as a resource well, and includes waters also known as produced formation water. The term includes all contaminants suspended or dissolved within the water.
assessed or assessment	by a suitably qualified and experienced person in relation to a consequence assessment of a dam, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit of the assessment: a) exactly what has been assessed and the precise nature of that determination b) the relevant legislative, regulatory and technical criteria on which the assessment has been based c) the relevant data and facts on which the assessment has been based, the source of that material, and the efforts made to obtain all relevant data and facts and d) the reasoning on which the assessment has been based using the relevant data and facts, and the relevant criteria.
Australian Height Datum or AHD	is the datum used for the determination of elevations in Australia. The determination uses a national network of benchmarks and tide gauges and sets mean sea level at zero elevation.

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Australian Standard AS3580	means any of the following publications: • *AS3580.10.1 Methods for sampling and analysis of ambient air—Determination of particulate matter—Deposited matter—Gravimetric method* • *AS3580.9.6 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM10 high volume sampler with size-selective inlet—Gravimetric method* • *AS3580.9.9 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter— PM10 low volume sampler—Gravimetric sampler.*
authorised resource activities	for this environmental authority means the resource activities authorised to be carried out under condition (A1).
background noise level	means the sound pressure level, measured in the absence of the noise under investigation, as the $L_{A90,T}$ being the A-weighted sound pressure level exceeded for 90 percent of the measurement time period T of not less than 15 minutes (or $LA_{90, adj, 15 mins}$), using Fast response.
bed and banks	for a watercourse or wetland means land over which the water of the watercourse or wetland normally flows or that is normally covered by the water, whether permanently or intermittently; but does not include land adjoining or adjacent to the bed or banks that is from time to time covered by floodwater.
being or intended to be utilised by the landholder or overlapping tenure holder	for significantly disturbed land, means there is a written agreement (e.g. land and compensation agreement) between the landholder or the overlapping tenure holder and the holder of the environmental authority identifying that the landholder or the overlapping tenure holder has a preferred use of the land such that rehabilitation standards for revegetation by the holder of the environmental authority are not required. For dams, means there is a written agreement (e.g. land and compensation agreement) between the landholder or the overlapping tenure holder and the holder of the environmental authority identifying that the landholder or the overlapping tenure holder has a preferred use for the dam such that rehabilitation standards for revegetation by the holder of the environmental authority are not required.
biodiversity values	for the purposes of this environmental authority, means Environmentally Sensitive Areas, areas containing matters of State environmental significance and wetlands.
bore	means a water observation bore or a water supply bore that is either sub-artesian or artesian.

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brine dam	means a regulated dam that is designed to receive, contain or evaporate brine.
Brine tank	Means a structure that is not a regulated dam or other regulated structure that is used to store brine generated by the water treatment plant.
BTEX	means benzene, toluene, ethylbenzene, ortho-xylene, para-xylene, meta-xylene and total xylene.
Category A Environmentally Sensitive Area	means any area listed in Schedule 19, Part 1, section 1 of the *Environmental Protection Regulation 2019.*
Category B Environmentally Sensitive Area	means any area listed in Schedule 19, Part 1, section 2 of the Environmental Protection Regulation 2019.
Category C Environmentally Sensitive Area	means any of the following areas: • nature refuges as defined in the conservation agreement for that refuge under the *Nature Conservation Act 1992* • koala habitat areas as defined under the *Nature Conservation (Koala) Conservation Plan 2006* • state forests or timber reserves as defined under the *Forestry Act 1959* • regional parks (previously known as resource reserves) under the *Nature Conservation Act 1992* • an area validated as 'essential habitat' or 'essential regrowth habitat' from ground-truthing surveys in accordance with the *Vegetation Management Act 1999* for a species of wildlife listed as endangered or vulnerable under the *Nature Conservation Act 1992* • 'of concern regional ecosystems' that are remnant vegetation and identified in the database called 'RE description database' containing regional ecosystem numbers and descriptions.
certify, certified or certification	in relation to any matter other than a design plan, 'as constructed' drawings or an annual report regarding dams means, a Statutory Declaration by a suitably qualified person or suitably qualified third party accompanying the written document stating: • the person's qualifications and experience relevant to the function • that the person has not knowingly included false, misleading or incomplete information in the document

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	• that the person has not knowingly failed to reveal any relevant information or document to the administering authority • that the document addresses the relevant matters for the function and is factually correct and • that the opinions expressed in the document are honestly and reasonably held.
clearing	has the meaning in the dictionary of the *Vegetation Management Act 2000* and for vegetation— a) means remove, cut down, ringbark, push over, poison or destroy in any way including by burning, flooding or draining but b) does not include destroying standing vegetation by stock, or lopping a tree.
closed-loop system	means using waste on site in a way that does not release waste or contaminants in the waste to the environment.
coal seam gas evaporation dam	is defined as a impoundment, enclosure or structure that is designed to be used to hold coal seam gas water for evaporation.
coal seam gas water	means underground water brought to the surface of the earth, or moved underground in connection with exploring for, or producing coal seam gas.
consequence category	means a category, either low, significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.
construction or constructed	in relation to a dam includes building a new dam and modifying or lifting an existing dam but does not include investigations and testing necessary for the purpose of preparing a design plan.
control measure	has the meaning in section 32 of the Environmental Protection Regulation 2019 and means a device, equipment, structure, or management strategy used to prevent or control the release of a contaminant or waste to the environment.
daily peak design capacity	for sewage treatment works, has the meaning in Schedule 2, section 63(4) of the Environmental Protection Regulation 2019 as the higher equivalent person (EP) for the works calculated using each of the formulae found in the definition for EP.

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dam	means a land-based structure or a void that contains, diverts or controls flowable substances, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and associated works.
design or design plan	is a document setting out how all identified consequence scenarios are addressed in the planned design and operation of a regulated structure.
design storage allowance or DSA	means an available volume, estimated in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*, published by the administering authority, as amended from time to time, that must be provided in a dam to an annual exceedance probability specified in that Manual.
development well	means a petroleum well which produces or stores petroleum. For clarity, a development well does not include an appraisal well.
document	has the meaning in the *Acts Interpretation Act 1954* and means: • any paper or other material on which there is writing and • any paper or other material on which there are marks and • figures, symbols or perforations having a meaning for a person qualified to interpret them and • any disc, tape or other article or any material from which sounds, images, writings or messages are capable of being produced or reproduced (with or without the aid of another article or device).
ecologically dominant layer	has the meaning in the *Methodology for Surveying and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Version 3.2 August 2012)* and means the layer making the greatest contribution to the overall biomass of the site and the vegetation community (NLWRA 2001). This is also referred to as the ecologically dominant stratum or the predominant canopy in woody ecosystems.
ecosystem function	means the interactions between and within living and nonliving components of an ecosystem and generally correlates with the size, shape and location of the vegetation community.
enclosed flare	means a device where the residual gas is burned in a cylindrical or rectilinear enclosure that includes a burning system and a damper where air for the combustion reaction is admitted.
environmental harm	has the meaning in section 14 of the *Environmental Protection Act 1994* and means any adverse effect, or potential adverse effect (whether temporary or permanent and of whatever

	magnitude, duration or frequency) on an environmental value, and includes environmental nuisance. Environmental harm may be caused by an activity— a) whether the harm is a direct or indirect result of the activity or b) whether the harm results from the activity alone or from the combined effects of the activity and other activities or factors.
environmental nuisance	has the meaning in section 15 of the *Environmental Protection Act 1994* and means unreasonable interference or likely interference with an environmental value caused by— a) aerosols, fumes, light, noise, odour, particles or smoke or b) an unhealthy, offensive or unsightly condition because of contamination or c) another way prescribed by regulation.
Environmentally Sensitive Area or ESA	means a Category A, B or C Environmentally Sensitive Area.
equivalent person or EP	has the meaning under section 3 of the *Planning Guidelines For Water Supply and Sewerage*, 2005, published by the Queensland Government. It is calculated in accordance with Schedule 2, Section 63 of the Environmental Protection Regulation 2019 where: • EP = V/200 where V is the volume, in litres, of the average dry weather flow of sewage that can be treated at the works in a day or • EP = M/2.5 where M is the mass, in grams, of phosphorus in the influent that the works are designed to treat as the inlet load in a day.
essential petroleum activity	means activities that are essential to bringing the resource to the surface and are only the following: • low impact petroleum activities • geophysical, geotechnical, geological, topographic and cadastral surveys (including seismic, sample /test / geotechnical pits, core holes) • single well sites not exceeding 1 hectare disturbance and multi-well sites not exceeding 1.5 hectare disturbance • well sites with monitoring equipment (including monitoring bores): ○ for single well sites, not exceeding 1.25 hectares disturbance

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	○ for multi-well sites, not exceeding 1.75 hectares disturbance. • well sites with monitoring equipment (including monitoring bores) and tanks (minimum 1 ML) for above ground fluid storage: ○ for single well sites, not exceeding 1.5 hectares disturbance ○ for multi-well sites, not exceeding 2.0 hectares disturbance. • associated infrastructure located on a well site necessary for the construction and operations of wells: ○ water pumps and generators ○ flare pits ○ chemical / fuel storages ○ sumps for residual drilling material and drilling fluids ○ tanks, or dams which are not significant or high consequence dams to contain wastewater (e.g. stimulation flow back waters, produced water) ○ pipe laydown areas ○ soil and vegetation stockpile areas ○ a temporary camp associated with a drilling rig that may involve sewage treatment works that are no release works ○ temporary administration sites and warehouses ○ dust suppression activities using water that meets the quality and operational standards approved under the environmental authority. • communication and power lines that are necessary for the undertaking of petroleum activities and that are located within well sites, well pads and pipeline right of ways without increasing the disturbance area of petroleum activities • supporting access tracks • gathering / flow pipelines from a wellhead to the initial compression facility activities necessary to achieve compliance with the conditions of the environmental authority in relation to another essential petroleum activity (e.g. sediment and erosion control measures, rehabilitation).
existing structure	means the Dawson Dam and Nipan Dam.

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exploration well	means a petroleum well that is drilled to: • explore for the presence of petroleum or natural underground reservoirs suitable for storing petroleum or • obtain stratigraphic information for the purpose of exploring for petroleum. For clarity, an exploration well does not include an appraisal or development well.
fill	means any kind of material in solid form (whether or not naturally occurring) capable of being deposited at a place but does not include material that forms a part of, or is associated with, a structure constructed in a watercourse, wetland or spring including a bridge, road, causeway, pipeline, rock revetment, drain outlet works, erosion prevention structure or fence.
flare pit	has the meaning in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*, and means the containment area where any hydrocarbon that is discovered in an over-pressured reservoir during a drilling operation is diverted to, and combusted, The flare pit is only used during the drilling and work over process on a petroleum well.
flare precipitant	means waste fluids which result from the operation of a flare.
floodplain	has the meaning in the *Water Act 2000* and means an area of reasonably flat land adjacent to a watercourse that— • is covered from time to time by floodwater overflowing from the watercourse and • does not, other than in an upper valley reach, confine floodwater to generally follow the path of the watercourse and • has finer sediment deposits than the sediment deposits of any bench, bar or in-stream island of the watercourse.
flowable substance	means matter or a mixture of materials which can flow under any conditions potentially affecting that substance. Constituents of a flowable substance can include water, other liquids fluids or solids, or a mixture that includes water and any other liquids fluids or solids either in solution or suspension.
green waste	means waste that is grass cuttings, trees, bushes, shrubs, material lopped from trees, untreated timber or other waste that is similar in nature but does not include declared pest species.
greywater	means wastewater generated from domestic activities such as laundry, dishwashing, and bathing. Greywater does not include sewage.

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growing	means to increase by natural development, as any living organism or part thereof by assimilation of nutriment; increase in size or substance.
high bank	means the defining terrace or bank or, if no bank is present, the point on the active floodplain, which confines the average annual peak flows in a watercourse.
holder	means any person who is the holder of, or is acting under, this environmental authority.
hydraulic integrity	refers to the capacity of a dam to contain or safely pass flowable substances based on its design.
hydraulic performance	means the capacity of a regulated dam to contain or safely pass flowable substances based on a probability (annual exceedance probability) of performance failure specified for the relevant consequence category Manual for *Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*, prepared by the Department of Environment and Resource Management, as amended from time to time.
impulsive	for noise, means sound characterised by brief excursions of sound pressure (acoustic impulses) that significantly exceed the background sound pressure. The duration of a single impulsive sound is usually less than one second.
incidental activity	for this environmental authority means an activity that is reasonably necessary for carrying out a petroleum activity.
$LA_{90,\ adj,\ 15\ mins}$	means the A-weighted sound pressure level, adjusted for tonal character that is equal to or exceeded for 90 percent of any 15 minutes sample period equal, using Fast response.
$LA_{eq,adj,15\ mins}$	means the A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within any 15 minute period has the same square sound pressure as a sound level that varies with time.
lake	means: • a lagoon, swamp or other natural collection of water, whether permanent or intermittent and • the bed and banks and any other element confining or containing the water.
land	means the solid substance of the earth's surface.
land degradation	has the meaning in the *Vegetation Management Act 1999* and means the following: • soil erosion • rising water tables

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	• the expression of salinity • mass movement by gravity of soil or rock • stream bank instability • a process that results in declining water quality.
landholder's active groundwater bore	means bores that are able to continue to provide a reasonable yield of water in terms of quantity for the bores authorised purpose or use. This term does not include monitoring bores owned by the administering authority of the *Water Act 2000*.
linear infrastructure	means powerlines, pipelines, flowlines, roads and access tracks.
liquid	means a substance which is flowing and offers no permanent resistance to changes of shape.
long term noise event	means a noise exposure, when perceived at a sensitive receptor, persists for a period of greater than five (5) days, even when there are respite periods when the noise is inaudible within those five (5) days.
low consequence dam	means any dam that is not classified as high or significant as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (635)*, published by the administering authority, as amended from time to time.
low impact petroleum activity	means authorised resource activities which do not result in the clearing of native vegetation, cause disruption to soil profiles through earthworks or excavation or result in significant disturbance to land which cannot be rehabilitated immediately using hand tools after the activity is completed. Examples of such activities include but are not necessarily limited to soil surveys (excluding test pits), topographic surveys, cadastral surveys and ecological surveys, may include installation of monitoring equipment provided that it is within the meaning of low impact and traversing land by car or foot via existing access tracks or routes or in such a way that does not result in permanent damage to vegetation.
Mandatory Reporting Level or MRL	means a warning and reporting level determined in accordance with the criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority.
matters of State environmental significance	has the meaning in Schedule 2 of the Environmental Offsets Regulation 2014.
maximum extent of impacts	means the total maximum, unabated, impact to a matter of State environmental significance that could to occur over the whole of project life.

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Max LpZ, 15 min	means the maximum value of the Z-weighted sound pressure level measured over 15 minutes.
medium term noise event	is a noise exposure, when perceived at a sensitive receptor, persists for an aggregate period not greater than five (5) days and does not re-occur for a period of at least four (4) weeks. Re-occurrence is deemed to apply where a noise of comparable level is observed at the same receptor location for a period of one hour or more, even if it originates from a difference source or source location.
method or methodology	means the science of method, especially dealing with the logical principles underlying the organisation of the various special sciences, and the conduct of scientific inquiry.
mix-bury-cover method	means the stabilisation of residual drilling solids in the bottom of a sump by mixing with subsoil and which occurs in accordance with the following methodology: • the base of the subsoil and residual solid mixture must be separated from the groundwater table by at least one metre of a continuous layer of impermeable subsoil material (kw=10–8m/s) or subsoil with a clay content of greater than 20 percent and • the residual solids is mixed with subsoil in the sump and cover and • the subsoil and residual solids is mixed at least three parts subsoil to one part waste (v/v) and • a minimum of one metre of clean subsoil must be placed over the subsoil and residual solids mixture and • topsoil is replaced.
month	has the meaning in the *Acts Interpretation Act 1954* and means a calendar month and is a period starting at the beginning of any day of one (1) of the 12 named months and ending— • immediately before the beginning of the corresponding day of the next named month or • if there is no such corresponding day—at the end of the next named month.
NATA accreditation	means accreditation by the National Association of Testing Authorities Australia.
petroleum activity	for this environmental authority means an authorised resource activity listed under the heading "Petroleum activities" in *Schedule A, General, Table 1—Authorised Resource Activities.*
petroleum well	has the meaning in Schedule 2 of the *Petroleum and Gas (Safety and Production) Act 2004*.
pipeline wastewater	means hydrostatic testing water, flush water or water from low point drains.

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pre-disturbed land use	means the function or use of the land as documented prior to significant disturbance occurring at that location.
predominant species	has the meaning in the *Methodology for Surveying and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Version 3.2 August 2012)* and means a species that contributes most to the overall above-ground biomass of a particular stratum.
prescribed contaminant	has the meaning in section 440ZD of the *Environmental Protection Act 1994* and means: a) earth or b) a contaminant prescribed under section 440ZF.
primary protection zone	means an area within 200 metres from the boundary of any Category A, B or C Environmentally Sensitive Area.
produced water	has the meaning in Section 15A of the *Petroleum and Gas (Production and Safety) Act 2004* and means coal seam gas water or associated water for a petroleum tenure.
Prohibited and restricted pest species	means any pest that is: (a) a plant or animal, other than a native species of plant or animal, that is (i) invasive biosecurity matter under the Biosecurity Act 2014 (Qld); or Notes— 1 See the Biosecurity Act 2014, schedule 1, part 3 or 4 or schedule 2, part 2; and 2 See the note to the Biosecurity Act 2014, schedules 1 and 2. (ii) controlled biosecurity matter or regulated biosecurity matter under the Biosecurity Act 2014 (Qld) (iii) tramp ants listed in schedule 1 and schedule 2 of the Biosecurity Act 2014 (Qld) a pest declared under a local law by the local government for the Land to be a pest because the pest is causing, or has the potential to cause, an adverse environmental, economic or social impact in all or part of the local government area.
project area	for this environmental authority, means the area located within the boundaries of Petroleum Lease 94.
protection zone	means the primary protection zone of any Category A, B or C Environmentally Sensitive Area or the secondary protection zone of any Category A or B Environmentally Sensitive Area.
regional ecosystem	has the meaning in the *Methodology for Surveying and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Version 3.2 August 2012)* and means a vegetation community in a bioregion that is consistently associated with a particular combination of geology, landform and soil. Regional ecosystems of Queensland were originally described in

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	Sattler and Williams (1999). The *Regional Ecosystem Description Database (Queensland Herbarium 2013)* is maintained by Queensland Herbarium and contains the current descriptions of regional ecosystems.
Register of Regulated Structures	includes**:** a) date of entry in the register b) name of the dam, its purpose and intended/actual contents c) the consequence category of the dam as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* d) dates, names, and reference for the design plan plus dates, names, and reference numbers of all document(s) lodged as part of a design plan for the dam e) name and qualifications of the suitably qualified and experienced person who certified the design plan and 'as constructed' drawings f) for the regulated dam: i. the dimensions (metres) and surface area (hectares) of the dam measured at the footprint of the dam ii. coordinates (latitude and longitude in GDA94) within five metres at any point from the outside of the dam including its storage area iii. dam crest volume (megalitres) iv. spillway crest level (metres AHD). v. maximum operating level (metres AHD) vi. storage rating table of stored volume versus level (metres AHD) vii. design storage allowance (megalitres) and associated level of the dam (metres AHD) viii. mandatory reporting level (metres AHD) g) the design plan title and reference relevant to the dam h) the date construction was certified as compliant with the design plan i) the name and details of the suitably qualified and experienced person who certified that the constructed dam was compliant with the design plan j) details of the composition and construction of any liner k) The system for the detection of any leakage through the floor and sides of the dam

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	l) dates when the regulated dam underwent an annual inspection for structural and operational adequacy, and to ascertain the available storage volume for 1 November of any year m) dates when recommendations and actions arising from the annual inspection were provided to the administering authority n) dam water quality as obtained from any monitoring required under this authority as at 1 November of each year.
regulated dam	means any dam in the significant or high consequence category as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*, published by the administering authority, as amended from time to time.
regulated structure	includes land-based containment structures, levees, bunds and voids, but not a tank or container designed and constructed to an Australian Standard that deals with strength and structural integrity.
rehabilitation or rehabilitated	means the process of reshaping and revegetating land to restore it to a stable landform and in accordance with the acceptance criteria set out in this environmental authority and, where relevant, includes remediation of contaminated land
reinstate or reinstatement	for pipelines, means the process of bulk earth works and structural replacement of pre-existing conditions of a site (i.e. soil surface typography, watercourses, culverts, fences and gates and other landscape(d) features) and is detailed in the *Australian Pipeline Industry Association (APIA) Code of Environmental Practice: Onshore Pipelines (2013)*.
reporting limit	means the lowest concentration that can be reliably measured within specified limits of precision and accuracy during routine laboratory operating conditions. For many analytes, the reporting limit is selected as the lowest non-zero standard in the calibration curve. Results that fall below the reporting limit will be reported as "less than" the value of the reporting limit. The reporting limit is also referred to as the practical quantitation limit or the limit of quantitation. For polycyclic aromatic hydrocarbons, the reporting limit must be based on super-ultra-trace methods and, depending on the specific polycyclic aromatic hydrocarbon, will range between 0.005 ug/L–0.02 ug/L.
residual drilling material	means waste drilling materials including muds and cuttings or cement returns from well holes and which have been left behind after the drilling fluids are pumped out.
restoration	means the replacement of structural habitat complexity, ecosystem processes, services and function from a disturbed or degraded site to that of a pre-determined or analogue site. For the purposes of pipelines, restoration applies to final rehabilitation after pipeline decommissioning.

restricted stimulation fluid	has the meaning in section 206 of the *Environmental Protection Act 1994* and means fluids used for the purpose of stimulation, including fracturing, that contain the following chemicals in more than the maximum amount prescribed under a regulation— a) petroleum hydrocarbons containing benzene, ethylbenzene, toluene or xylene b) chemicals that produce, or are likely to produce, benzene, ethylbenzene, toluene or xylene as the chemical breaks down in the environment.
revegetation, revegetating or revegetate	means to actively re-establish vegetation through seeding or planting techniques in accordance with site specific management plans.
secondary protection zone	in relation to a Category A or Category B Environmentally Sensitive Area means an area within 100 metres from the boundary of the primary protection zone.
secondary treated class B standards	means treated sewage effluent or greywater which meets the following standards: • total phosphorous as P, maximum 20 mg/L • total nitrogen as N, maximum 30 mg/L • 5-day biochemical oxygen demand (inhibited) (e.g. release pipe from sewage treatment plant), maximum 20 mg/L • suspended solids, maximum 30mg/L • pH, range 6.0 to 8.5 • e-coli, 80th percentile based on at least 5 samples with not less than 30 minutes between samples, 1000cfu per 100mL, maximum 10 000cfu per 100mL.
secondary treated class C standards	means treated sewage effluent or greywater which meets the following standards: • total phosphorous as P, maximum 20mg/L • total nitrogen as N, maximum 30mg/L • 5-day biochemical oxygen demand (inhibited) (e.g. Release pipe from sewage treatment plant), maximum 20mg/L • suspended solids, maximum 30mg/L • pH, range 6.0 to 8.5 • e-Coli, 80th percentile based on at least 5 samples with not less than 30 minutes between samples, 10 000cfu per 100mL, maximum 100 000cfu per 100mL.

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sensitive place	means: • a dwelling (including residential allotment, mobile home or caravan park, residential marina or other residential premises, motel, hotel or hostel) • a library, childcare centre, kindergarten, school, university or other educational institution • a medical centre, surgery or hospital • a protected area • a public park or garden that is open to the public (whether or not on payment of money) for use other than for sport or organised entertainment • a work place used as an office or for business or commercial purposes, which is not part of the authorised resource activity(ies) and does not include employees accommodation or public roads • for noise, a place defined as a sensitive receptor for the purposes of the *Environmental Protection (Noise) Policy 2019*.
sensitive receptor	is defined in Schedule 2 of the *Environmental Protection (Noise) Policy 2019*, and means an area or place where noise is measured.
short term noise event	is a noise exposure, when perceived at a sensitive receptor, persists for an aggregate period not greater than eight hours and does not re-occur for a period of at least seven (7) days. Re-occurrence is deemed to apply where a noise of comparable level is observed at the same receptor location for a period of one hour or more, even if it originates from a different source or source location.
significantly disturbed or significant disturbance or significant disturbance to land or areas	means Land is *significantly disturbed* if– (a) it is contaminated land; or (b) it has been disturbed and human intervention is needed to rehabilitate it– (i) to a condition required under the relevant environmental authority; or (ii) if the environmental authority does not require the land to be rehabilitated to a particular condition–to the condition it was in immediately before the disturbance. Without limiting subsection (1)(b), land requires human intervention to rehabilitate it if– (a) the disturbance has made the land more susceptible to erosion; or (b) the land use capability or suitability of the land is diminished; or

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	(c) the quality of water in a watercourse downstream of the land has been significantly reduced. i.
significant residual impact	has the meaning in section 8 *Environmental Offsets Act 2014* and includes impacts specified as a significant residual impact in *Schedule F, Protecting Biodiversity Values, Table 3—Matters of State Environmental Significance.*
species richness	means the number of different species in a given area.
specified relevant activity	for this environmental authority means an activity that: a) but for being carried out as a resource activity, would otherwise be a prescribed ERA b) stimulation activities c) point source discharge of treated produced water to surface waters d) storing waste that is not regulated waste (including coal seam gas water) in a regulated dam e) storing coal seam gas water that is not regulated waste in a low consequence dam; or f) borrow pits or quarries that extract more than 5000 tonnes of material in the project area.
spring	means the land to which water rises naturally from below the ground and the land over which the water then flows.
stable	means the rehabilitation and restoration of the site is enduring or permanent so that the site is unlikely to collapse, erode or subside.
stimulation	means a technique used to increase the permeability of natural underground reservoir that is undertaken above the formation pressure and involves the addition of chemicals. It includes hydraulic fracturing / hydrofraccing, fracture acidizing and the use of proppant treatments. Explanatory note: This definition is restricted from that in the *Petroleum and Gas (Production and Safety) Act 2004* in order to only capture the types of stimulation activities that pose a risk to environmental values of water quality in aquifers.
stimulation fluid	means the fluid injected underground to increase permeability. For clarity, the term stimulation fluid only applies to fluid injected down well post-perforation.
stimulation impact zone	means a 100m maximum radial distance from the stimulation target location within a gas producing formation.
structure	means a dam or levee.

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suitably qualified and experienced person	in relation to regulated structures means a person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the *Professional Engineers Act 2002*, and has demonstrated competency and relevant experience: • for regulated dams, an RPEQ who is a civil engineer with the required qualifications in dam safety and dam design. • for regulated levees, an RPEQ who is a civil engineer with the required qualifications in the design of flood protection embankments. Note: It is permissible that a suitably qualified and experienced person obtain subsidiary certification from an RPEQ who has demonstrated competence and relevant experience in either geomechanics, hydraulic design or engineering hydrology.
suitably qualified person	means a person who has professional qualifications, training or skills or experience relevant to the nominated subject matters and can give authoritative assessment, advice and analysis about performance relevant to the subject matters using relevant protocols, standards, methods or literature.
suitably qualified third party	means a person who: a) has qualifications and experience relevant to performing the function including but not limited to: i. a bachelor's degree in science or engineering and ii. 3 years' experience in undertaking soil contamination assessments and b) is a member of at least one organisation prescribed in Schedule 14 of the Environmental Protection Regulation 2019; and c) not be an employee of, nor have a financial interest or any involvement which would lead to a conflict of interest with the holder(s) of the environmental authority.
sump	means a pit in which waste residual drilling material or drilling fluids are stored only for the duration of drilling activities.
synthetic based drilling mud	means a mud where the base fluid is a synthetic oil, consisting of chemical compounds which are artificially made or synthesised by chemically modifying petroleum components or other raw materials rather than the whole crude oil.
system design plan	means a plan that manages an integrated containment system that shares the required design storage allowance and/or extreme storm storage volume across the integrated containment system.
top soil	means the surface (top) layer of a soil profile, which is more fertile, darker in colour, better structured and supports greater biological activity than underlying layers. The surface layer

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	may vary in depth depending on soil forming factors, including parent material, location and slope, but generally is not greater than about 300 millimetres in depth from the natural surface.
total density of course woody material	means the total length of logs on the ground greater than or equal to 10 centimetres diameter per hectare and number of logs on the ground greater than or equal to 10 centimetres diameter per hectare.
transmissivity	means the rate of flow of water through a vertical strip of aquifer which is one unit wide and which extends the full saturated depth of the aquifer.
trenchless methods	means construction methods for the installation of pipelines and cables below the ground with minimal excavation. Trenchless methods can include, but not necessarily be limited to: • moling • pipe ramming method • horizontal directional drilling • utility tunnelling, pipe jacking, auger boring • micro tunnelling and pipe jacking • on-line replacement.
valid complaint	means all complaints unless considered by the administering authority to be frivolous, vexatious or based on mistaken belief.
underground gas storage	means evaluating, developing and using natural underground reservoirs for petroleum storage or to store prescribed storage gases, including, for example, to store petroleum or prescribed storage gases for others.
void	means any constructed, open excavation in the ground.
waste and resource management hierarchy	has the meaning provided in section 9 of the *Waste Reduction and Recycling Act 2011* and is the following precepts, listed in the preferred order in which waste and resource management options should be considered— a) AVOID unnecessary resource consumption b) REDUCE waste generation and disposal c) RE-USE waste resources without further manufacturing d) RECYCLE waste resources to make the same or different products

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	e) RECOVER waste resources, including the recovery of energy f) TREAT waste before disposal, including reducing the hazardous nature of waste g) DISPOSE of waste only if there is no viable alternative.
waste and resource management principles	has the meaning provided in section 4(2)(b) of the *Waste Reduction and Recycling Act 2011* and means the: a) polluter pays principle b) user pays principle c) proximity principle d) product stewardship principle.
waste fluids	has the meaning in section 13 of the *Environmental Protection Act 1994* in conjunction with the common meaning of "fluid" which is "a substance which is capable of flowing and offers no permanent resistance to changes of shape". Accordingly, to be a waste fluid, the waste must be a substance which is capable of flowing and offers no permanent resistance to changes of shape.
watercourse	has the meaning in Schedule 4 of the *Environmental Protection Act 1994* and means 1) a river, creek or stream in which water flows permanently or intermittently— a) in a natural channel, whether artificially improved or not or b) in an artificial channel that has changed the course of the watercourse. 2) Watercourse includes the bed and banks and any other element of a river, creek or stream confining or containing water.
waters	includes all or any part of a creek, river, stream, lake, lagoon, swamp, wetland, spring, unconfined surface water, unconfined water in natural or artificial watercourses, bed and bank of any waters, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and underground water.
wellhead	Means the casing head, and includes any casing hanger or spool, or tubing hanger, and any flow control equipment up to and including the wing valves.
well integrity	the ability of a well to contain the substances flowing through it.
wetland	for the purpose of this environmental authority, wetland means: an area shown as a wetland on the map of Queensland Wetland Environmental Values.

	Note: The Environmental Protection (Water and Wetland Biodiversity) Policy 2019 Schedule 2, Map of Queensland Wetland Environmental Values means the document 'Map of Queensland Wetland Environmental Values' made by the Chief Executive and published on the website. *Environmental values in section 8 of the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 apply to wetland areas on the map, which are categorised as wetlands of high or general ecological significance.*